FIG.1

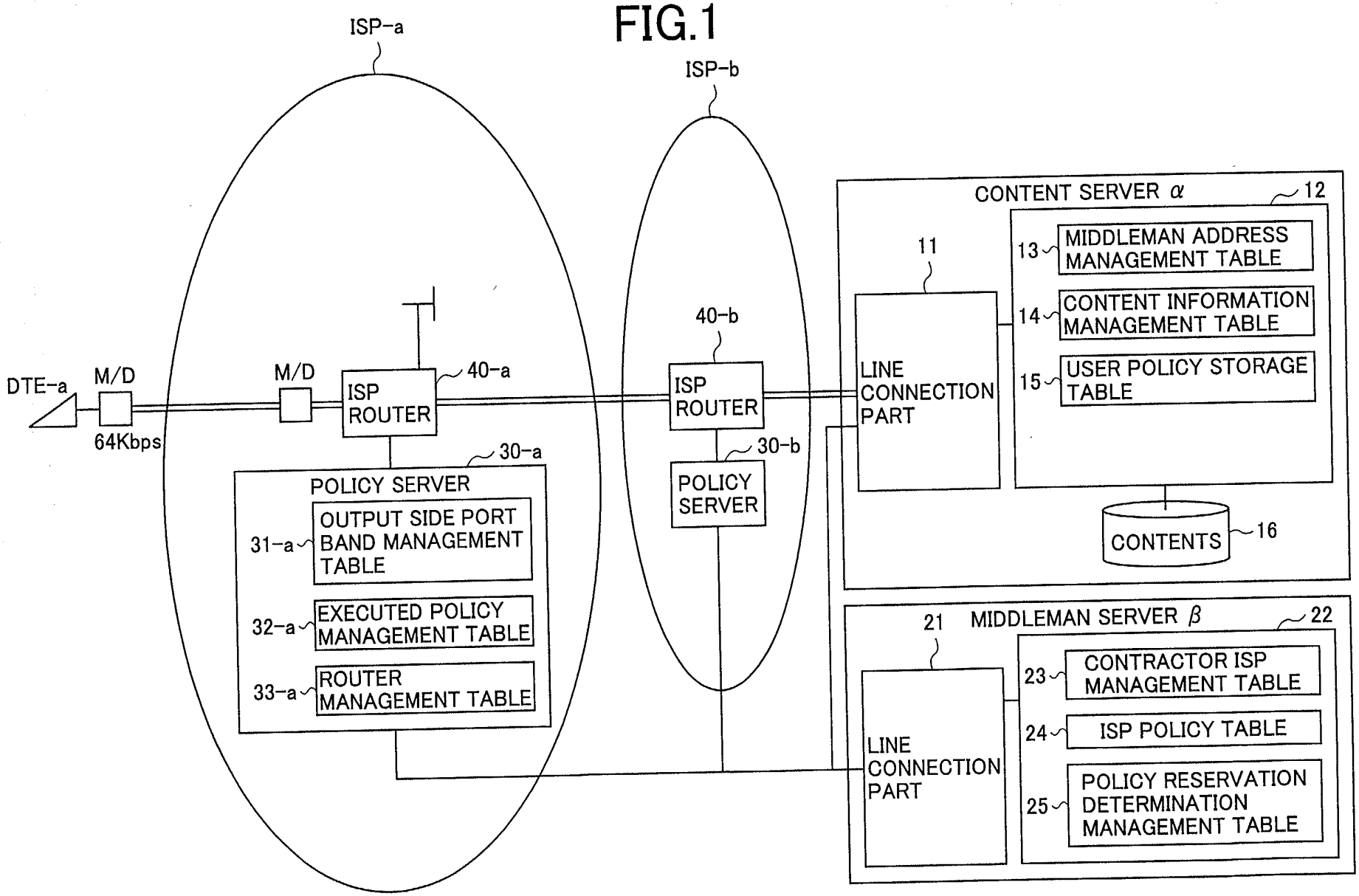

ISP-a
ISP-b
DTE-a
M/D
64Kbps
M/D
ISP ROUTER
40-a
40-b
ISP ROUTER
30-a
POLICY SERVER
31-a
OUTPUT SIDE PORT BAND MANAGEMENT TABLE
32-a
EXECUTED POLICY MANAGEMENT TABLE
33-a
ROUTER MANAGEMENT TABLE
30-b
POLICY SERVER
CONTENT SERVER α
12
11
LINE CONNECTION PART
13
MIDDLEMAN ADDRESS MANAGEMENT TABLE
14
CONTENT INFORMATION MANAGEMENT TABLE
15
USER POLICY STORAGE TABLE
CONTENTS
16
21
MIDDLEMAN SERVER β
22
LINE CONNECTION PART
23
CONTRACTOR ISP MANAGEMENT TABLE
24
ISP POLICY TABLE
25
POLICY RESERVATION DETERMINATION MANAGEMENT TABLE

FIG.2A

MIDDLEMAN SERVER IP ADDRESS
138.10.0.1

FIG.2B

CONTENT NAME	CAPACITY
CONTENT A	57.6Mbyte
CONTENT B	28.8Mbyte

FIG.2C

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	134.30.0.1

FIG.3A

NETWORK ADDRESS	POLICY SERVER IP ADDRESS	CLIENT MANAGEMENT SERVER IP ADDRESS
130.0.0.0/9	130.40.0.3	130.40.0.4
132.0.0.0/9	132.50.0.3	132.50.0.4
132.0.0.0/9	132.40.0.3	134.40.0.4

FIG.3B

ORDER RECEPTION NO.	POLICY SERVER IP ADDRESS	USER IP ADDRESS	CONTENT SERVER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS
β 1	134.40.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	134.30.0.1
β 2	132.50.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	132.40.0.1
β 3	130.40.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	130.30.0.1

FIG.3C

CONTENT SERVER IP ADDRESS	ORDER -ING NO.	ORDER RECEPTION NUMBER	POLICY SERVER IP ADDRESS	RESERVATION RESULT
136.10.0.1	α 1	β 1	134.40.0.3	
		β 2	132.50.0.3	
		β 3	130.40.0.3	

FIG.4A

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Rc	P10	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Rc	P11	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Rd	P14	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M
Rd	P16	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M

FIG.4B

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β 1	134.10.0.5	P10

FIG.4C

ROUTER PORT IP ADDRESS	ROUTER VIRTUAL IP ADDRESS
134.10.0.1	134.10.0.5
134.20.0.1	
134.30.0.1	
134.40.0.1	
134.50.0.1	134.50.0.5
134.60.0.1	
134.20.0.2	

FIG.5

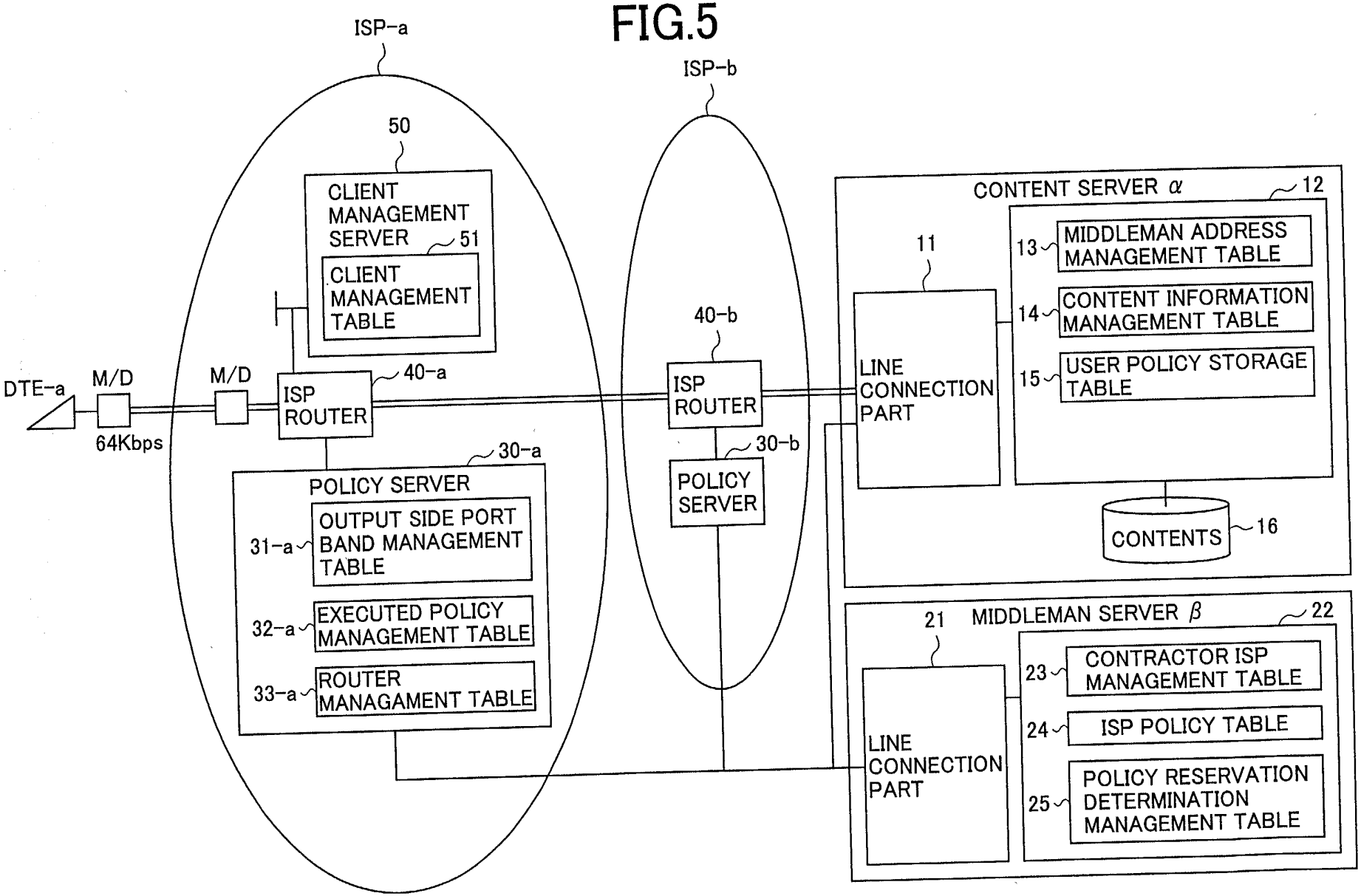

ISP-a
ISP-b
50
CLIENT MANAGEMENT SERVER
51
CLIENT MANAGEMENT TABLE
DTE-a
M/D
64Kbps
M/D
ISP ROUTER
40-a
40-b
ISP ROUTER
30-a
POLICY SERVER
31-a
OUTPUT SIDE PORT BAND MANAGEMENT TABLE
32-a
EXECUTED POLICY MANAGEMENT TABLE
33-a
ROUTER MANAGAMENT TABLE
30-b
POLICY SERVER
CONTENT SERVER α
12
11
LINE CONNECTION PART
13
MIDDLEMAN ADDRESS MANAGEMENT TABLE
14
CONTENT INFORMATION MANAGEMENT TABLE
15
USER POLICY STORAGE TABLE
CONTENTS
16
21
MIDDLEMAN SERVER β
22
LINE CONNECTION PART
23
CONTRACTOR ISP MANAGEMENT TABLE
24
ISP POLICY TABLE
25
POLICY RESERVATION DETERMINATION MANAGEMENT TABLE

FIG.6

USER IP ADDRESS	CONNECTION BAND (bps)
130.10.0.2	64K
130.20.0.2	128K
130.10.0.3	

FIG.7

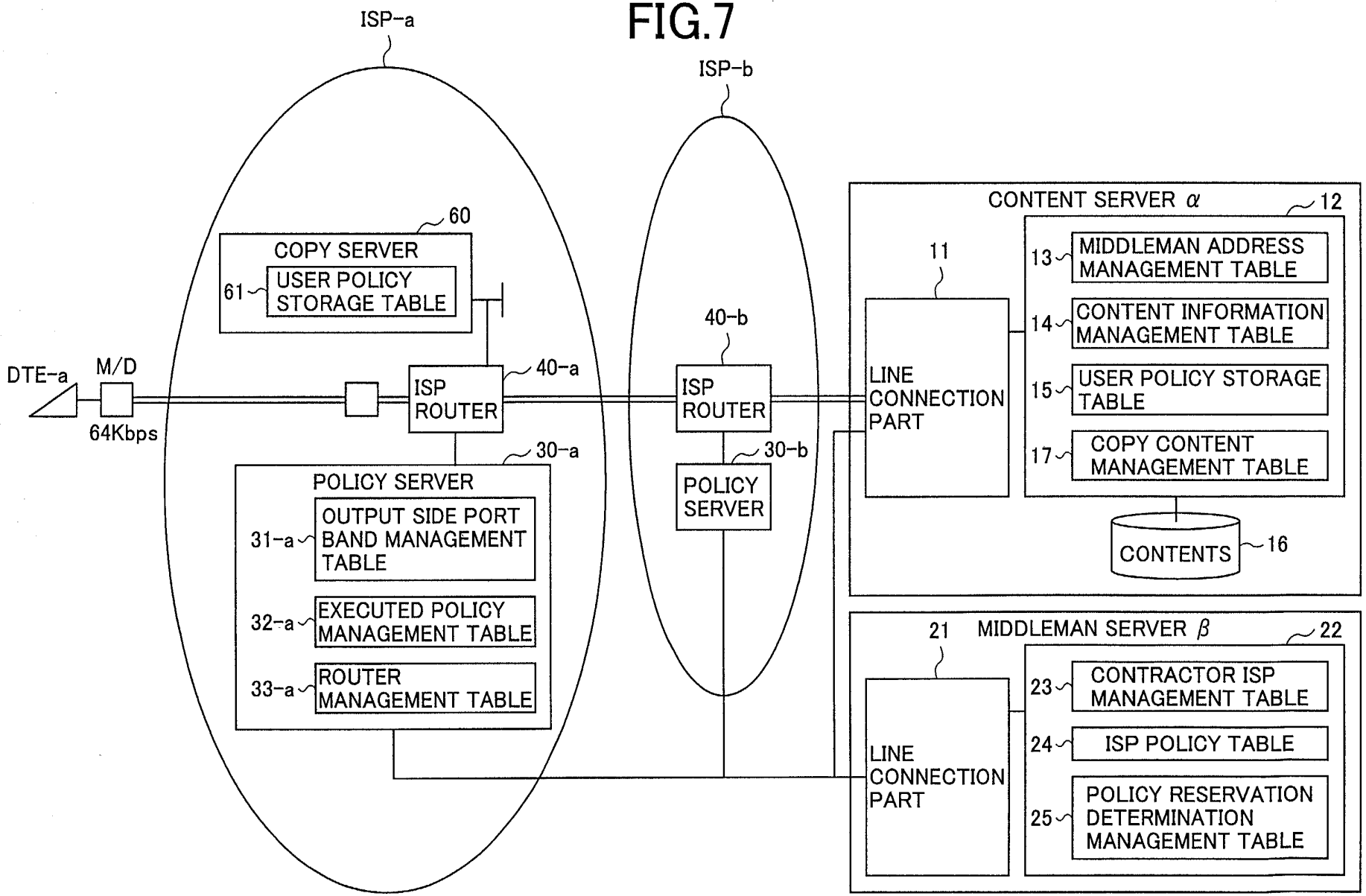

ISP-a
ISP-b
60
COPY SERVER
61
USER POLICY STORAGE TABLE
DTE-a
M/D
64Kbps
ISP ROUTER
40-a
40-b
ISP ROUTER
30-a
POLICY SERVER
31-a
OUTPUT SIDE PORT BAND MANAGEMENT TABLE
32-a
EXECUTED POLICY MANAGEMENT TABLE
33-a
ROUTER MANAGEMENT TABLE
30-b
POLICY SERVER
CONTENT SERVER α
12
11
LINE CONNECTION PART
13
MIDDLEMAN ADDRESS MANAGEMENT TABLE
14
CONTENT INFORMATION MANAGEMENT TABLE
15
USER POLICY STORAGE TABLE
17
COPY CONTENT MANAGEMENT TABLE
CONTENTS
16
21
MIDDLEMAN SERVER β
22
LINE CONNECTION PART
23
CONTRACTOR ISP MANAGEMENT TABLE
24
ISP POLICY TABLE
25
POLICY RESERVATION DETERMINATION MANAGEMENT TABLE

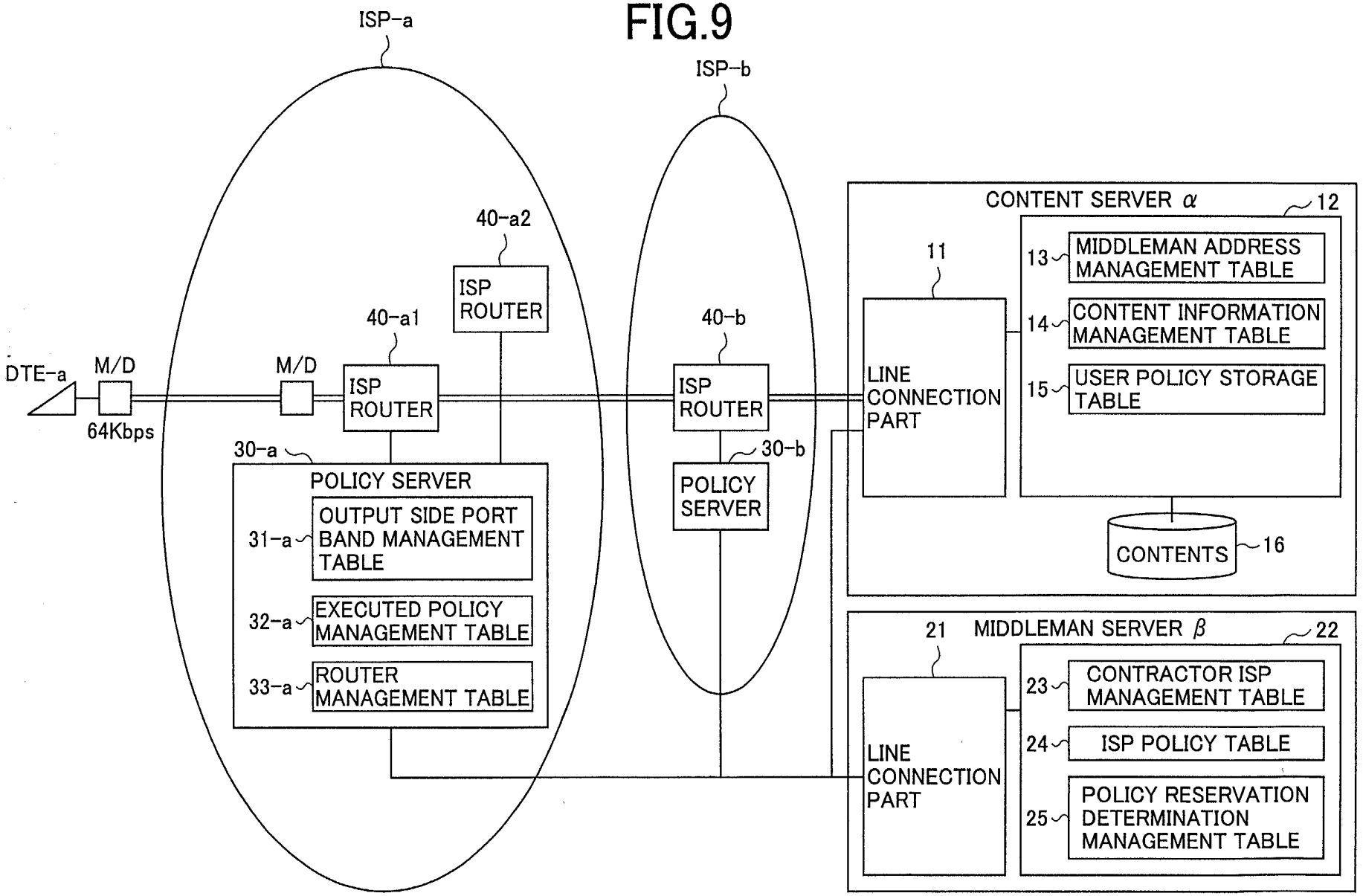
FIG.8A

NETWORK ADDRESS	COPY SERVER IP ADDRESS
130.0.0.0/9	130.40.0.2
132.0.0.0/9	132.50.0.2
134.0.0.0/9	134.40.0.2

FIG.8B

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	

FIG.9


ISP-a
ISP-b
CONTENT SERVER α
12
11
13
MIDDLEMAN ADDRESS MANAGEMENT TABLE
14
CONTENT INFORMATION MANAGEMENT TABLE
15
USER POLICY STORAGE TABLE
LINE CONNECTION PART
CONTENTS
16
40-a2
ISP ROUTER
40-a1
40-b
DTE-a
M/D
M/D
ISP ROUTER
ISP ROUTER
64Kbps
30-a
POLICY SERVER
30-b
POLICY SERVER
31-a
OUTPUT SIDE PORT BAND MANAGEMENT TABLE
32-a
EXECUTED POLICY MANAGEMENT TABLE
33-a
ROUTER MANAGEMENT TABLE
21
MIDDLEMAN SERVER β
22
LINE CONNECTION PART
23
CONTRACTOR ISP MANAGEMENT TABLE
24
ISP POLICY TABLE
25
POLICY RESERVATION DETERMINATION MANAGEMENT TABLE

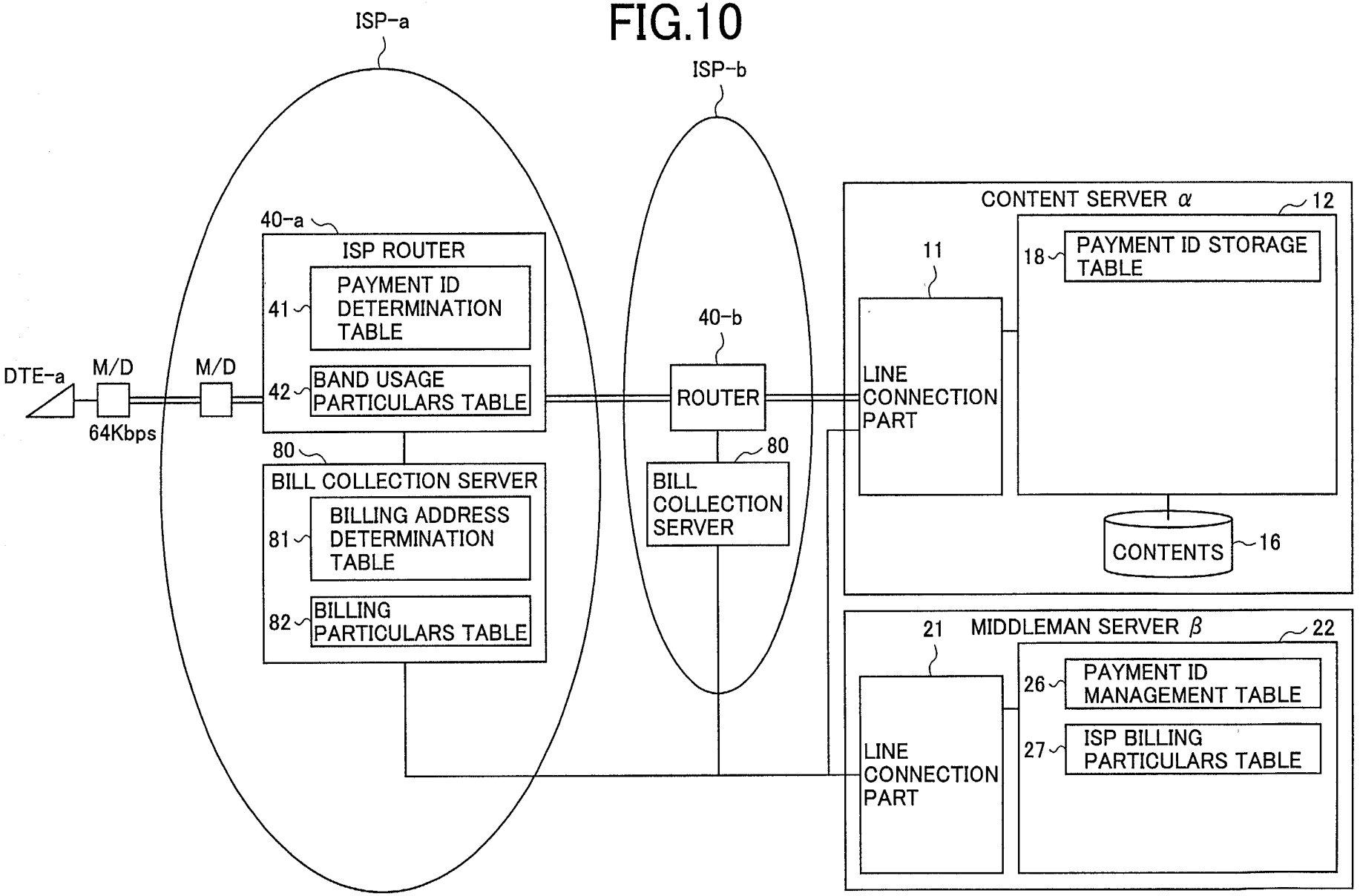

ISP-a
ISP-b
40-a
ISP ROUTER
41
PAYMENT ID DETERMINATION TABLE
42
BAND USAGE PARTICULARS TABLE
80
BILL COLLECTION SERVER
81
BILLING ADDRESS DETERMINATION TABLE
82
BILLING PARTICULARS TABLE
DTE-a
M/D
M/D
64Kbps
40-b
ROUTER
80
BILL COLLECTION SERVER
CONTENT SERVER α
12
11
18
PAYMENT ID STORAGE TABLE
LINE CONNECTION PART
CONTENTS
16
MIDDLEMAN SERVER β
21
22
26
PAYMENT ID MANAGEMENT TABLE
27
ISP BILLING PARTICULARS TABLE
LINE CONNECTION PART

FIG.11A

PAYMENT ID
β 1

FIG.11B

PAYMENT ID	CONTENT SERVER IP ADDRESS
β 1	136.10.0.1
β 2	140.10.0.1

FIG.11C

AMOUNT BILLED (YEN)	PAYMENT ID	DESTINA-TION IP ADDRESS	DESTINA-TION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME	ISP SERVER IP ADDRESS
aaa	β 1	130.20.0.2	10	64K	2001/9/1 9:00	2001/9/1 11:00	134.40.0.2
ccc	β 1	130.10.0.2	30	64K	2001/9/1 10:00	2001/9/1 12:00	134.40.0.2

FIG.12A

PAYMENT ID	MIDDLEMAN SERVER IP ADDRESS
β 1	138.10.0.1
β 2	138.10.0.1

FIG.12C

PAYMENT ID
β 1
β 2

FIG.12B

AMOUNT BILLED (YEN)	PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
aaa	β 1	130.20.0.2	10	64K	2001/9/1 9:00	2001/9/1 11:00
bbb	β 1	130.10.0.2	30	64K	2001/9/1 10:00	2001/9/1 12:00
ccc	β 1	132.20.0.2	20	64K	2001/9/1 9:00	2001/9/1 12:00

FIG.12D

PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
β	130.20.0.2	10	64K	2001/9/1 9:00	2001/9/1 11:00
β	130.10.0.2	30	64K	2001/9/1 10:00	2001/9/1 12:00

FIG.13A

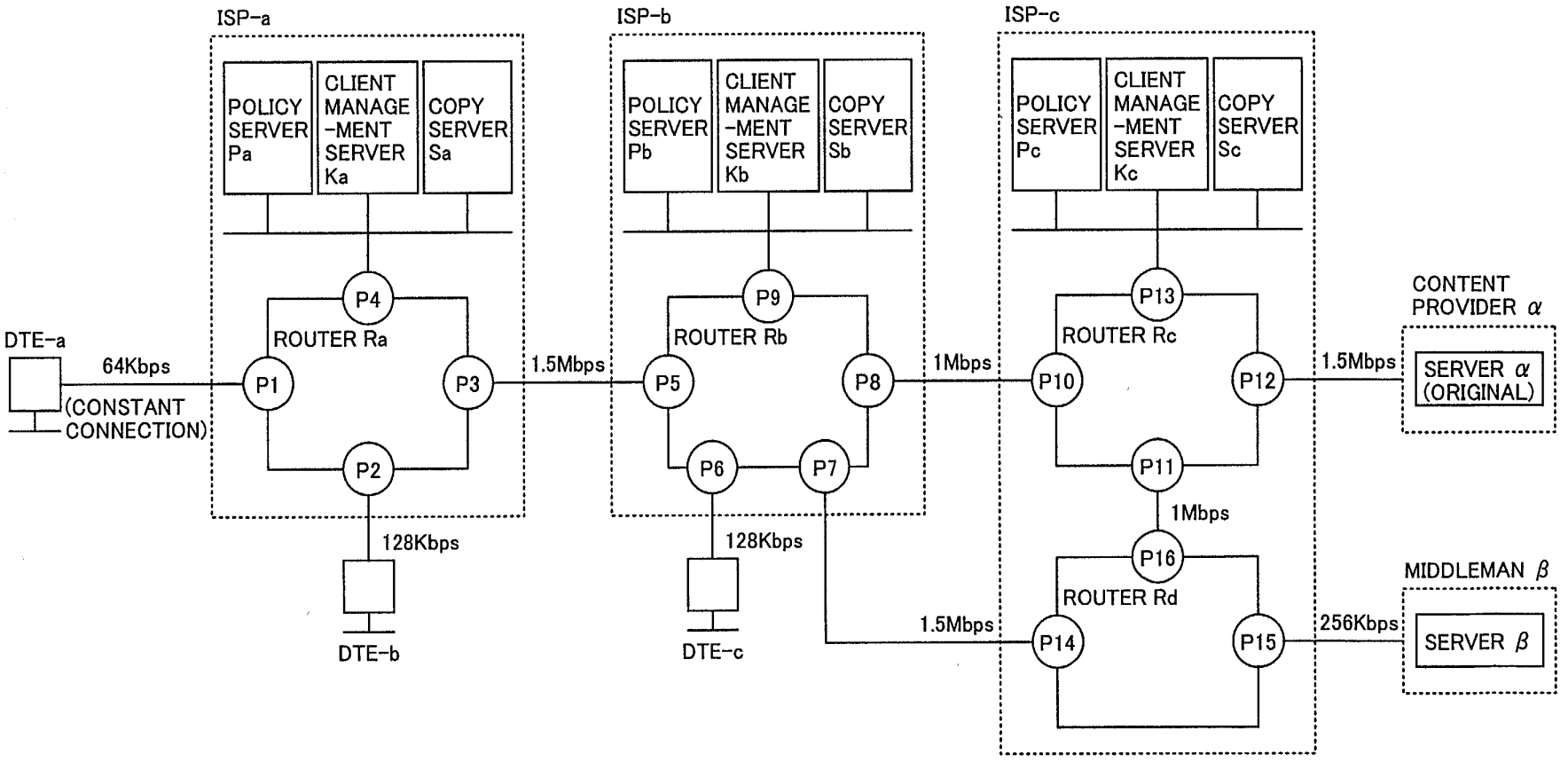

ISP-a
ISP-b
ISP-c
POLICY SERVER Pa
CLIENT MANAGE -MENT SERVER Ka
COPY SERVER Sa
POLICY SERVER Pb
CLIENT MANAGE -MENT SERVER Kb
COPY SERVER Sb
POLICY SERVER Pc
CLIENT MANAGE -MENT SERVER Kc
COPY SERVER Sc
P1
P2
P3
P4
P5
P6
P7
P8
P9
P10
P11
P12
P13
P14
P15
P16
ROUTER Ra
ROUTER Rb
ROUTER Rc
ROUTER Rd
DTE-a
64Kbps
(CONSTANT CONNECTION)
1.5Mbps
1Mbps
1.5Mbps
CONTENT PROVIDER α
SERVER α (ORIGINAL)
128Kbps
DTE-b
128Kbps
DTE-c
1Mbps
1.5Mbps
256Kbps
MIDDLEMAN β
SERVER β

FIG.13B

TERMINAL/ SERVER	IP ADDRESS	ISP-a	PORT	IP ADDRESS	ISP-b	PORT	IP ADDRESS	ISP-c	PORT	IP ADDRESS
DTE-a	130.10.0.2	ROUTER Ra	P1	130.10.0.1	ROUTER Rb	P5	132.10.0.1	ROUTER Rc	P10	134.10.0.1
DTE-b	130.20.0.2		P2	130.20.0.1		P6	132.20.0.1		P11	134.20.0.1
DTE-c	132.30.0.2		P3	130.30.0.1		P7	132.30.0.1		P12	134.30.0.1
SERVER α	136.10.0.1		P4	130.40.0.1		P8	132.40.0.1		P13	134.40.0.1
SERVER β	138.10.0.1	VIRTUAL IP ADDRESS (Ra)	-	130.10.0.5		P9	132.50.0.1	ROUTER Rd	P14	134.50.0.1
		SERVER Pa	-	130.40.0.3	VIRTUAL IP ADDRESS (Rb)	-	132.10.0.5		P15	134.60.0.1
		SERVER Ka	-	130.40.0.4	SERVER Pb	-	132.50.0.3		P16	134.20.0.2
		SERVER Sa	-	130.40.0.2	SERVER Kb	-	132.50.0.4	VIRTUAL IP ADDRESS (Rc)	-	134.10.0.5
					SERVER Sb	-	132.50.0.2	VIRTUAL IP ADDRESS (Rd)	-	134.50.0.5
								SERVER Pc	-	134.40.0.3
								SERVER Kc	-	134.40.0.4
								SERVER Sc	-	134.40.0.2

FIG.14A

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)

FIG.14B

MIDDLEMAN SERVER IP ADDRESS
138.10.0.1

FIG.14C

CONTENT NAME	CAPACITY
CONTENT A	57.6M
CONTENT B	28.8M

FIG.15A

NETWORK ADDRESS	POLICY SERVER IP ADDRESS	CLIENT MANAGEMENT SERVER IP ADDRESS
130.0.0.0/9	130.40.0.3	130.40.0.4
132.0.0.0/9	132.50.0.3	132.50.0.4
134.0.0.0/9	134.40.0.3	134.40.0.4

FIG.15B

ORDER RECEPTION NO.	POLICY SERVER IP ADDRESS	USER IP ADDRESS	CONTENT SERVER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS

FIG.15C

CONTENT SERVER IP ADDRESS	ORDER -ING NO.	ORDER RECEPTION NUMBER	POLICY SERVER IP ADDRESS	RESERVATION RESULT

FIG.16A

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Ra	P1	—	—	—	—	—	—	—	—	—	—	—	—	—
Ra	P2	—	—	—	—	—	—	—	—	—	—	—	—	—

FIG.16B

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Rb	P5	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.372M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M
Rb	P6	—	—	—	—	—	—	—	—	—	—	—	—	—

FIG.16C

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Rc	P10	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Rc	P11	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Rd	P14	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M
Rd	P16	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M

FIG.17A

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.20.0.2	132.30.0.2	128K	2001/9/1 10:00	2001/9/1 12:00				

FIG.17B

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	132.30.0.2	130.20.0.2	128K	2001/9/1 10:00	2001/9/1 12:00				

FIG.17C

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.

FIG.18A

ROUTER PORT IP ADDRESS	ROUTER VIRTUAL IP ADDRESS
130.10.0.1	130.10.0.5
130.20.0.1	
130.30.0.1	
130.40.0.1	

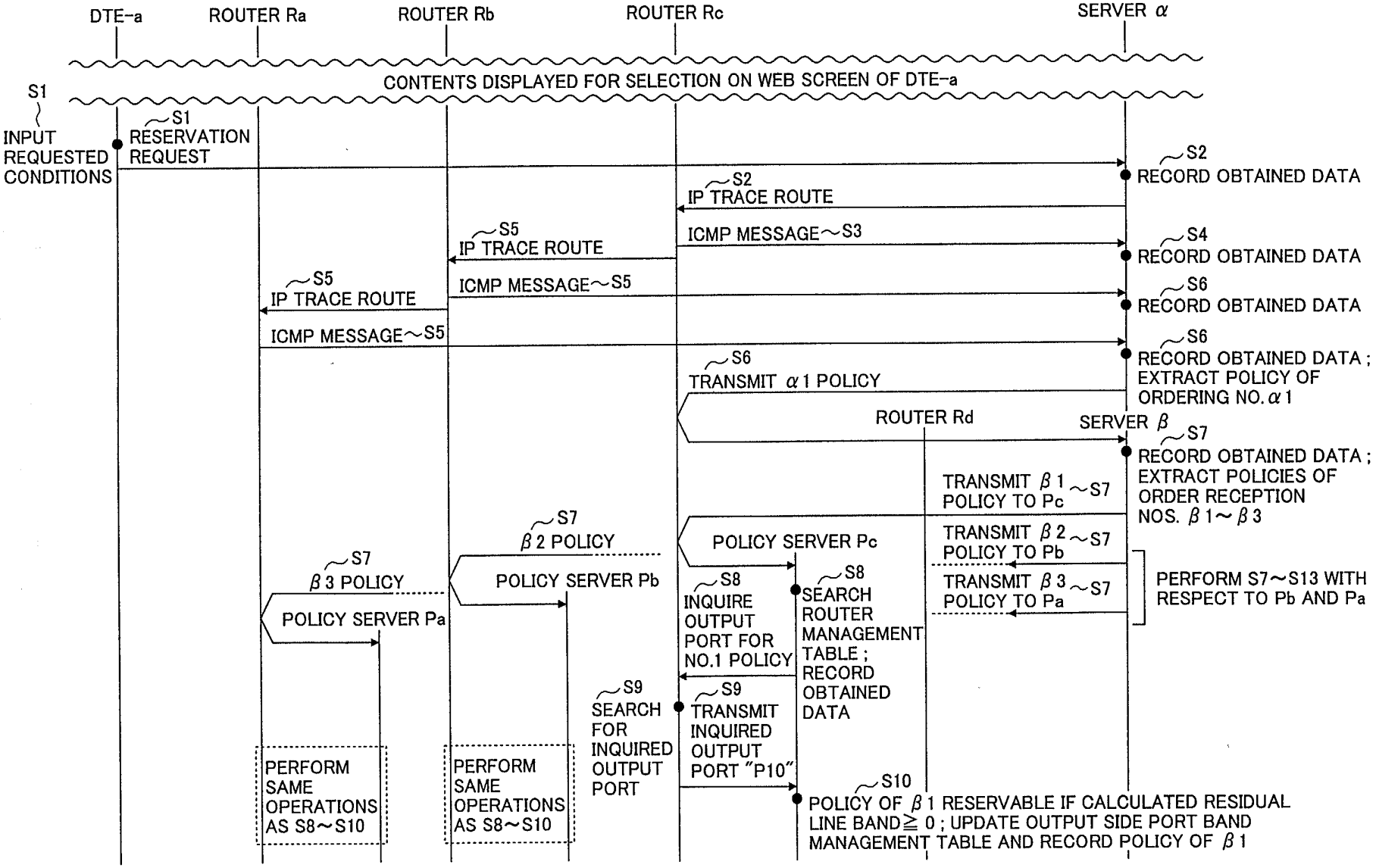
FIG.18B

ROUTER PORT IP ADDRESS	ROUTER VIRTUAL IP ADDRESS
132.10.0.1	132.10.0.5
132.20.0.1	
132.30.0.1	
132.40.0.1	
132.50.0.1	

FIG.18C

ROUTER PORT IP ADDRESS	ROUTER VIRTUAL IP ADDRESS
134.10.0.1	134.10.0.5
134.20.0.1	
134.30.0.1	
134.40.0.1	
134.50.0.1	134.50.0.5
134.60.0.1	
134.20.0.2	

FIG.19


DTE-a
ROUTER Ra
ROUTER Rb
ROUTER Rc
SERVER α
CONTENTS DISPLAYED FOR SELECTION ON WEB SCREEN OF DTE-a
S1
INPUT REQUESTED CONDITIONS
S1
RESERVATION REQUEST
S2
RECORD OBTAINED DATA
S2
IP TRACE ROUTE
ICMP MESSAGE
S3
S4
RECORD OBTAINED DATA
S5
IP TRACE ROUTE
S5
IP TRACE ROUTE
ICMP MESSAGE
S5
S6
RECORD OBTAINED DATA
ICMP MESSAGE
S5
S6
RECORD OBTAINED DATA ; EXTRACT POLICY OF ORDERING NO. α1
S6
TRANSMIT α1 POLICY
ROUTER Rd
SERVER β
S7
RECORD OBTAINED DATA ; EXTRACT POLICIES OF ORDER RECEPTION NOS. β1～β3
TRANSMIT β1 POLICY TO Pc
S7
S7
β2 POLICY
POLICY SERVER Pc
TRANSMIT β2 POLICY TO Pb
S7
S7
β3 POLICY
POLICY SERVER Pb
S8
INQUIRE OUTPUT PORT FOR NO.1 POLICY
S8
SEARCH ROUTER MANAGEMENT TABLE ; RECORD OBTAINED DATA
TRANSMIT β3 POLICY TO Pa
S7
PERFORM S7～S13 WITH RESPECT TO Pb AND Pa
POLICY SERVER Pa
S9
SEARCH FOR INQUIRED OUTPUT PORT
S9
TRANSMIT INQUIRED OUTPUT PORT "P10"
PERFORM SAME OPERATIONS AS S8～S10
PERFORM SAME OPERATIONS AS S8～S10
S10
POLICY OF β1 RESERVABLE IF CALCULATED RESIDUAL LINE BAND≧0 ; UPDATE OUTPUT SIDE PORT BAND MANAGEMENT TABLE AND RECORD POLICY OF β1

UNCLASSIFIED

FIG.20

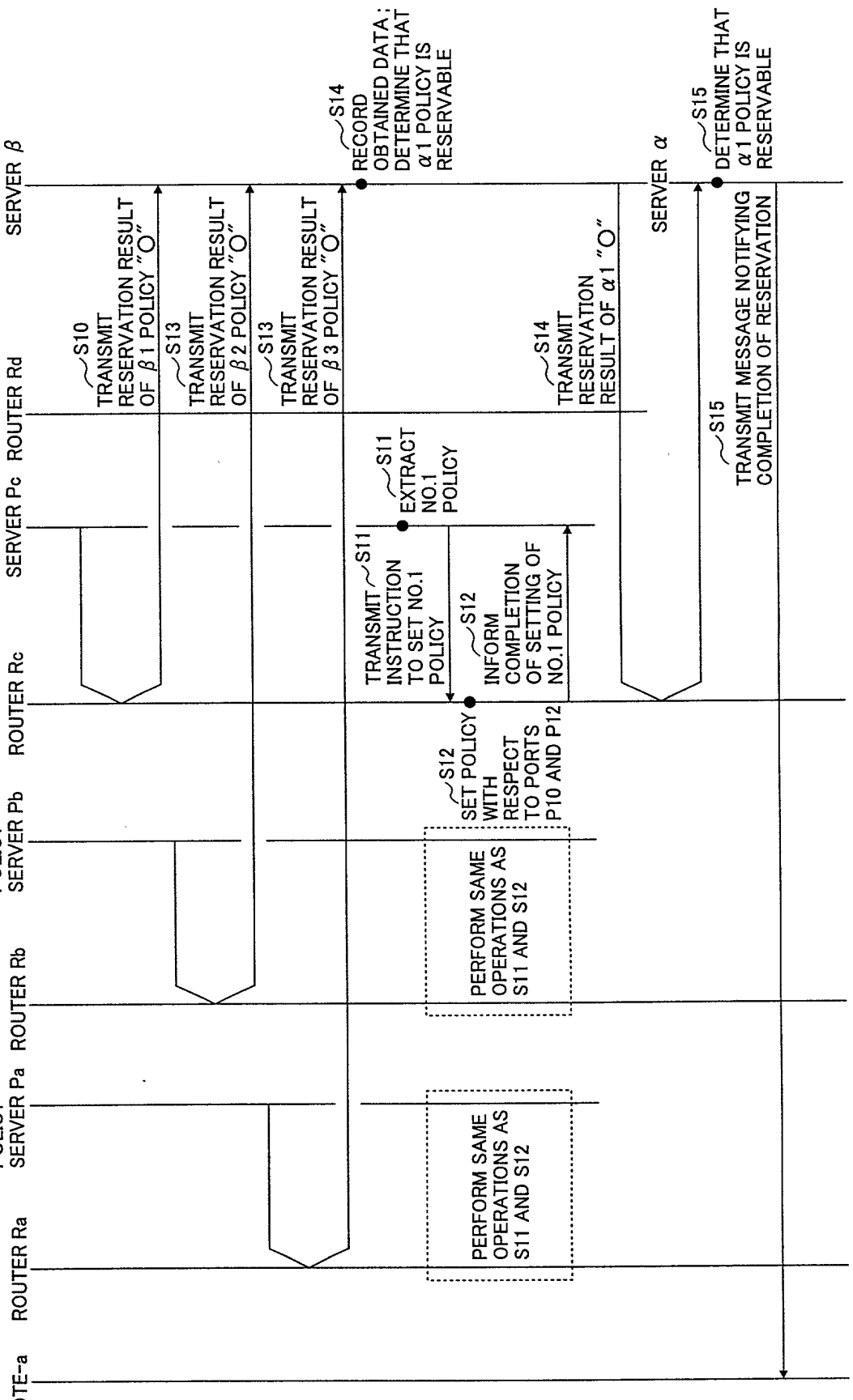


FIG.21

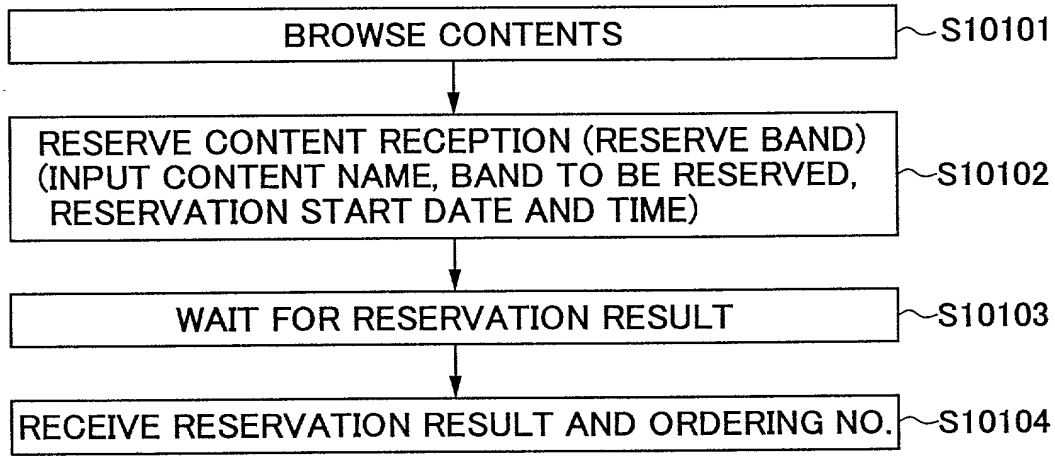

BROWSE CONTENTS
S10101
RESERVE CONTENT RECEPTION (RESERVE BAND)
(INPUT CONTENT NAME, BAND TO BE RESERVED,
RESERVATION START DATE AND TIME)
S10102
WAIT FOR RESERVATION RESULT
S10103
RECEIVE RESERVATION RESULT AND ORDERING NO.
S10104

FIG.22

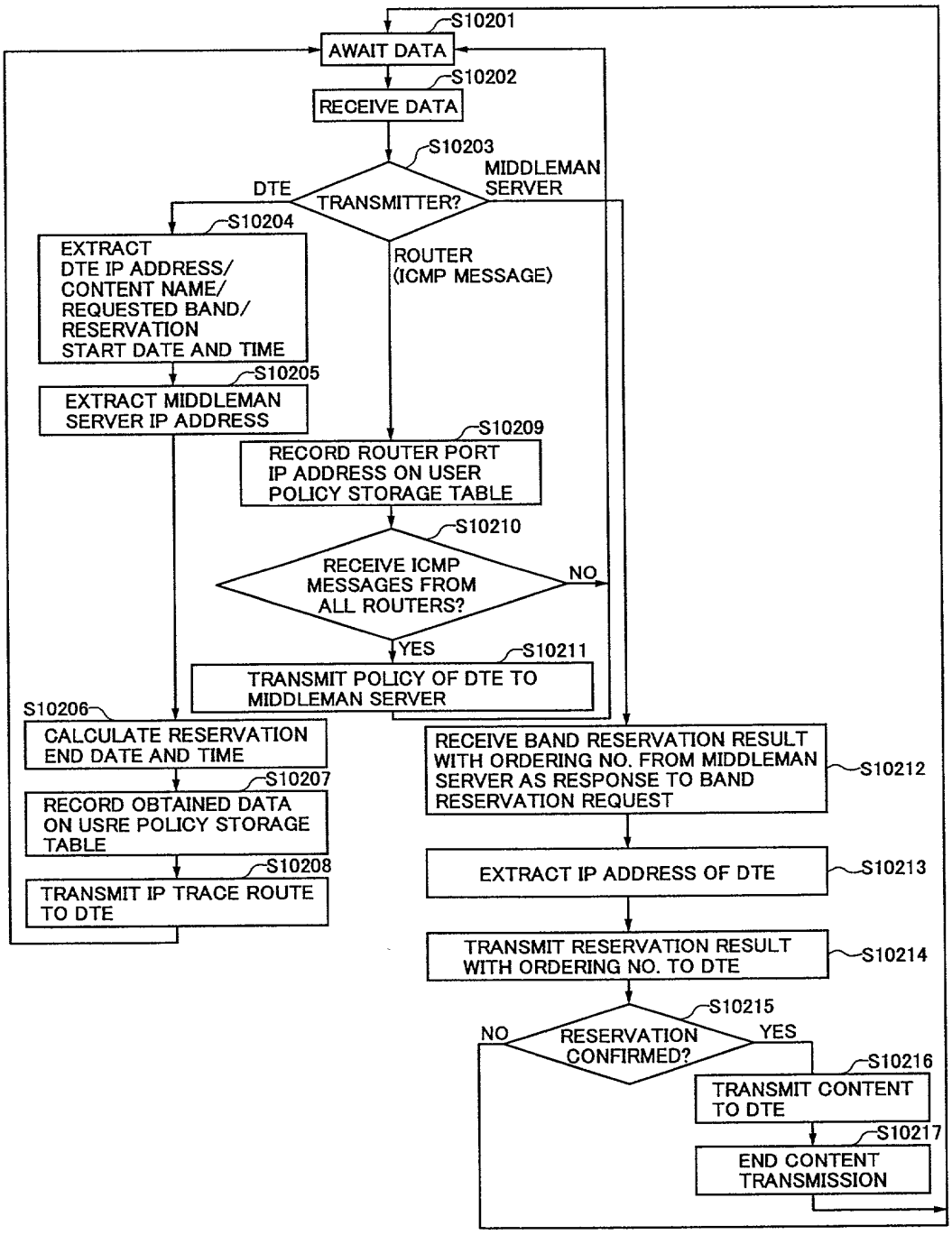

S10201
AWAIT DATA
S10202
RECEIVE DATA
S10203
DTE
TRANSMITTER?
MIDDLEMAN SERVER
S10204
EXTRACT DTE IP ADDRESS/ CONTENT NAME/ REQUESTED BAND/ RESERVATION START DATE AND TIME
ROUTER (ICMP MESSAGE)
S10205
EXTRACT MIDDLEMAN SERVER IP ADDRESS
S10209
RECORD ROUTER PORT IP ADDRESS ON USER POLICY STORAGE TABLE
S10210
RECEIVE ICMP MESSAGES FROM ALL ROUTERS?
NO
YES
S10211
TRANSMIT POLICY OF DTE TO MIDDLEMAN SERVER
S10206
CALCULATE RESERVATION END DATE AND TIME
S10207
RECORD OBTAINED DATA ON USRE POLICY STORAGE TABLE
S10208
TRANSMIT IP TRACE ROUTE TO DTE
RECEIVE BAND RESERVATION RESULT WITH ORDERING NO. FROM MIDDLEMAN SERVER AS RESPONSE TO BAND RESERVATION REQUEST
S10212
EXTRACT IP ADDRESS OF DTE
S10213
TRANSMIT RESERVATION RESULT WITH ORDERING NO. TO DTE
S10214
S10215
NO
RESERVATION CONFIRMED?
YES
S10216
TRANSMIT CONTENT TO DTE
S10217
END CONTENT TRANSMISSION

FIG.23

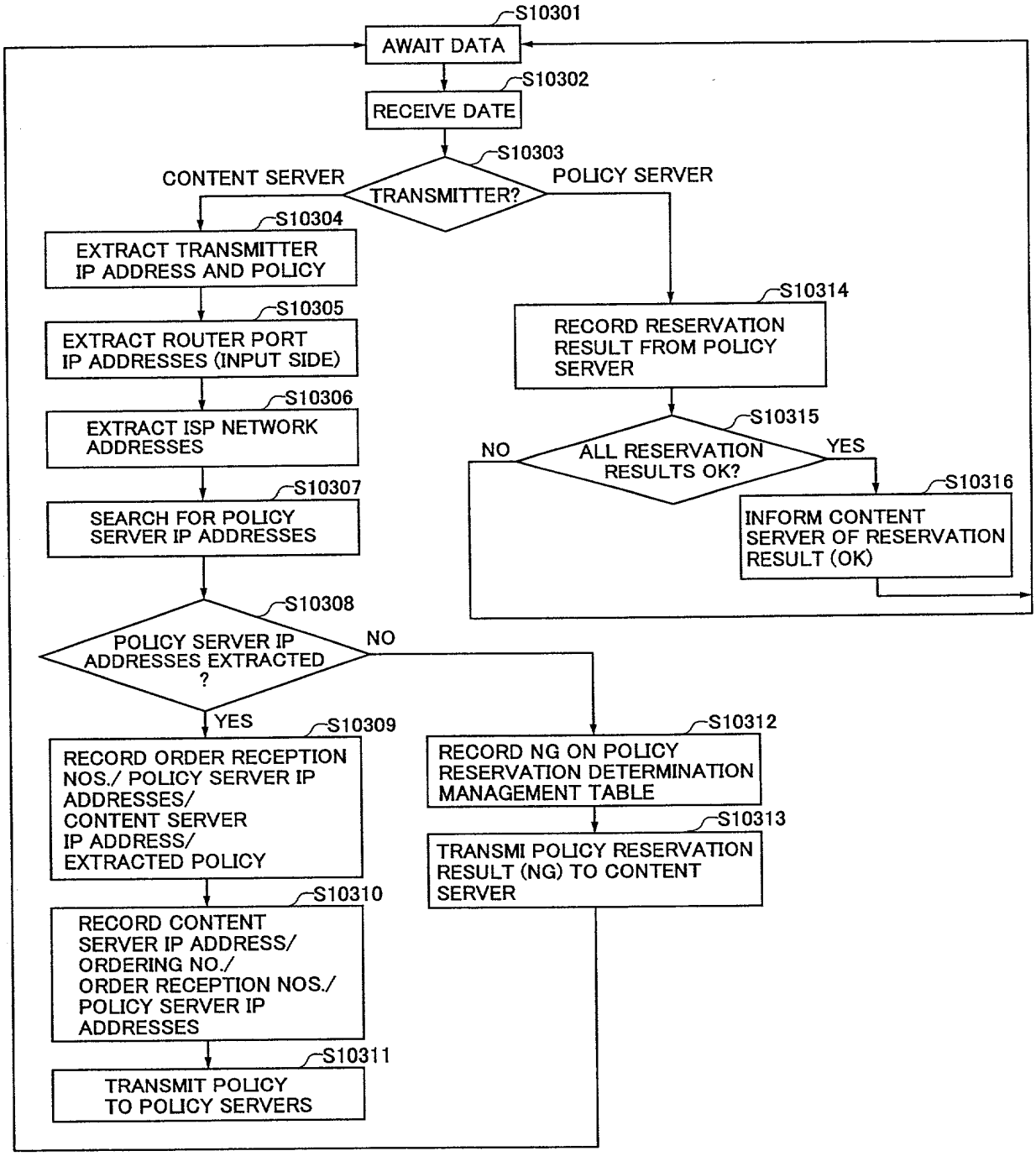

S10301
AWAIT DATA
S10302
RECEIVE DATE
S10303
TRANSMITTER?
CONTENT SERVER
POLICY SERVER
S10304
EXTRACT TRANSMITTER IP ADDRESS AND POLICY
S10305
EXTRACT ROUTER PORT IP ADDRESSES (INPUT SIDE)
S10306
EXTRACT ISP NETWORK ADDRESSES
S10307
SEARCH FOR POLICY SERVER IP ADDRESSES
S10308
POLICY SERVER IP ADDRESSES EXTRACTED ?
NO
YES
S10309
RECORD ORDER RECEPTION NOS./ POLICY SERVER IP ADDRESSES/ CONTENT SERVER IP ADDRESS/ EXTRACTED POLICY
S10310
RECORD CONTENT SERVER IP ADDRESS/ ORDERING NO./ ORDER RECEPTION NOS./ POLICY SERVER IP ADDRESSES
S10311
TRANSMIT POLICY TO POLICY SERVERS
S10312
RECORD NG ON POLICY RESERVATION DETERMINATION MANAGEMENT TABLE
S10313
TRANSMI POLICY RESERVATION RESULT (NG) TO CONTENT SERVER
S10314
RECORD RESERVATION RESULT FROM POLICY SERVER
S10315
ALL RESERVATION RESULTS OK?
NO
YES
S10316
INFORM CONTENT SERVER OF RESERVATION RESULT (OK)

FIG.24

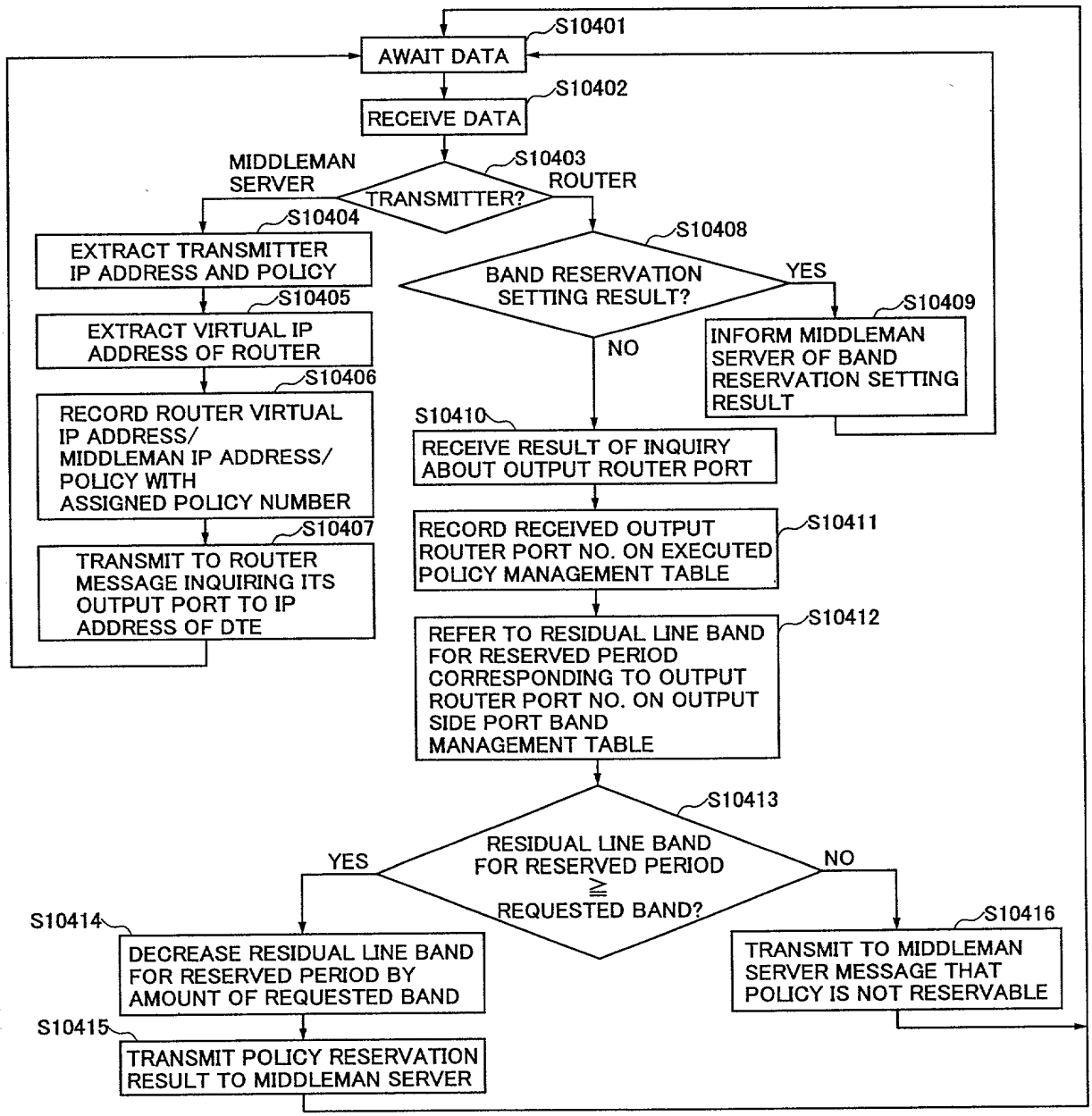

S10401
AWAIT DATA
S10402
RECEIVE DATA
MIDDLEMAN SERVER
S10403
TRANSMITTER?
ROUTER
S10404
EXTRACT TRANSMITTER IP ADDRESS AND POLICY
S10405
EXTRACT VIRTUAL IP ADDRESS OF ROUTER
S10406
RECORD ROUTER VIRTUAL IP ADDRESS/ MIDDLEMAN IP ADDRESS/ POLICY WITH ASSIGNED POLICY NUMBER
S10407
TRANSMIT TO ROUTER MESSAGE INQUIRING ITS OUTPUT PORT TO IP ADDRESS OF DTE
S10408
BAND RESERVATION SETTING RESULT?
YES
NO
S10409
INFORM MIDDLEMAN SERVER OF BAND RESERVATION SETTING RESULT
S10410
RECEIVE RESULT OF INQUIRY ABOUT OUTPUT ROUTER PORT
S10411
RECORD RECEIVED OUTPUT ROUTER PORT NO. ON EXECUTED POLICY MANAGEMENT TABLE
S10412
REFER TO RESIDUAL LINE BAND FOR RESERVED PERIOD CORRESPONDING TO OUTPUT ROUTER PORT NO. ON OUTPUT SIDE PORT BAND MANAGEMENT TABLE
S10413
RESIDUAL LINE BAND FOR RESERVED PERIOD ≧ REQUESTED BAND?
YES
NO
S10414
DECREASE RESIDUAL LINE BAND FOR RESERVED PERIOD BY AMOUNT OF REQUESTED BAND
S10415
TRANSMIT POLICY RESERVATION RESULT TO MIDDLEMAN SERVER
S10416
TRANSMIT TO MIDDLEMAN SERVER MESSAGE THAT POLICY IS NOT RESERVABLE

FIG.25

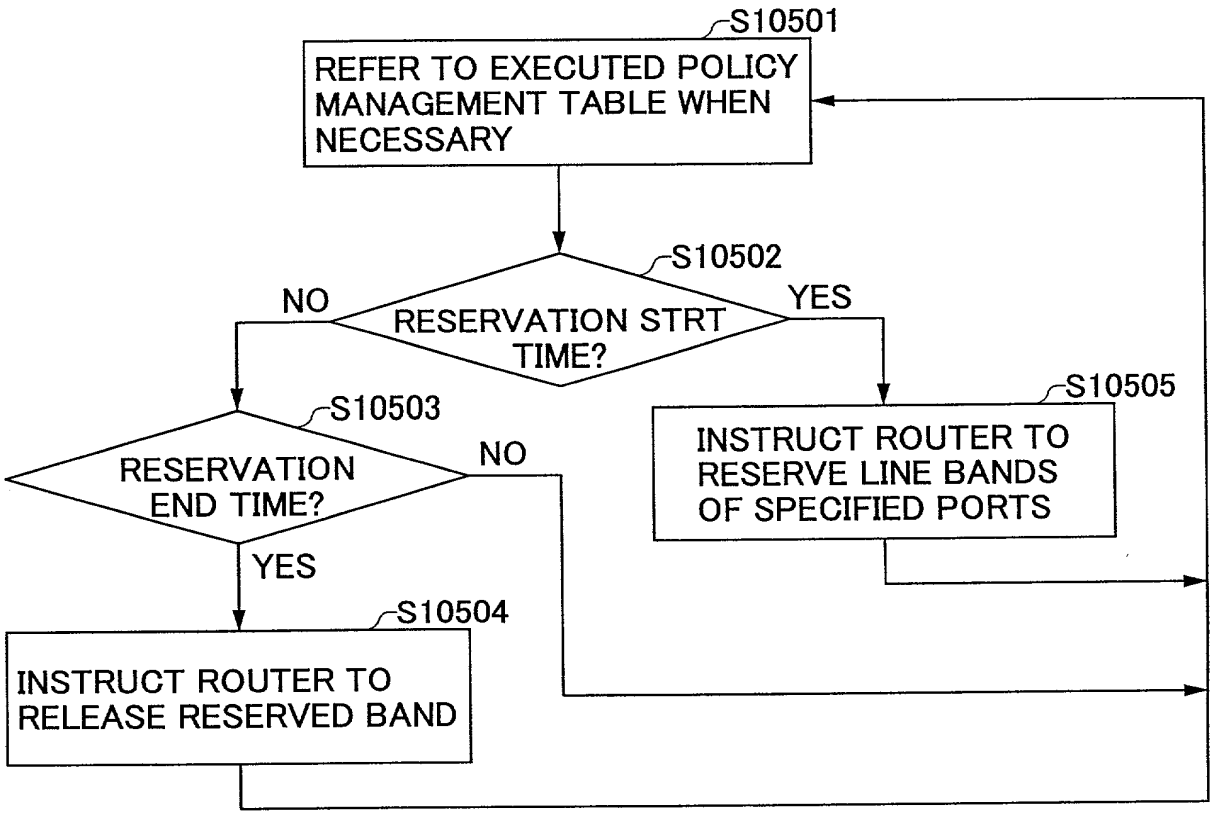

S10501
REFER TO EXECUTED POLICY MANAGEMENT TABLE WHEN NECESSARY
S10502
RESERVATION STRT TIME?
NO
YES
S10503
RESERVATION END TIME?
NO
YES
S10504
INSTRUCT ROUTER TO RELEASE RESERVED BAND
S10505
INSTRUCT ROUTER TO RESERVE LINE BANDS OF SPECIFIED PORTS

FIG.26

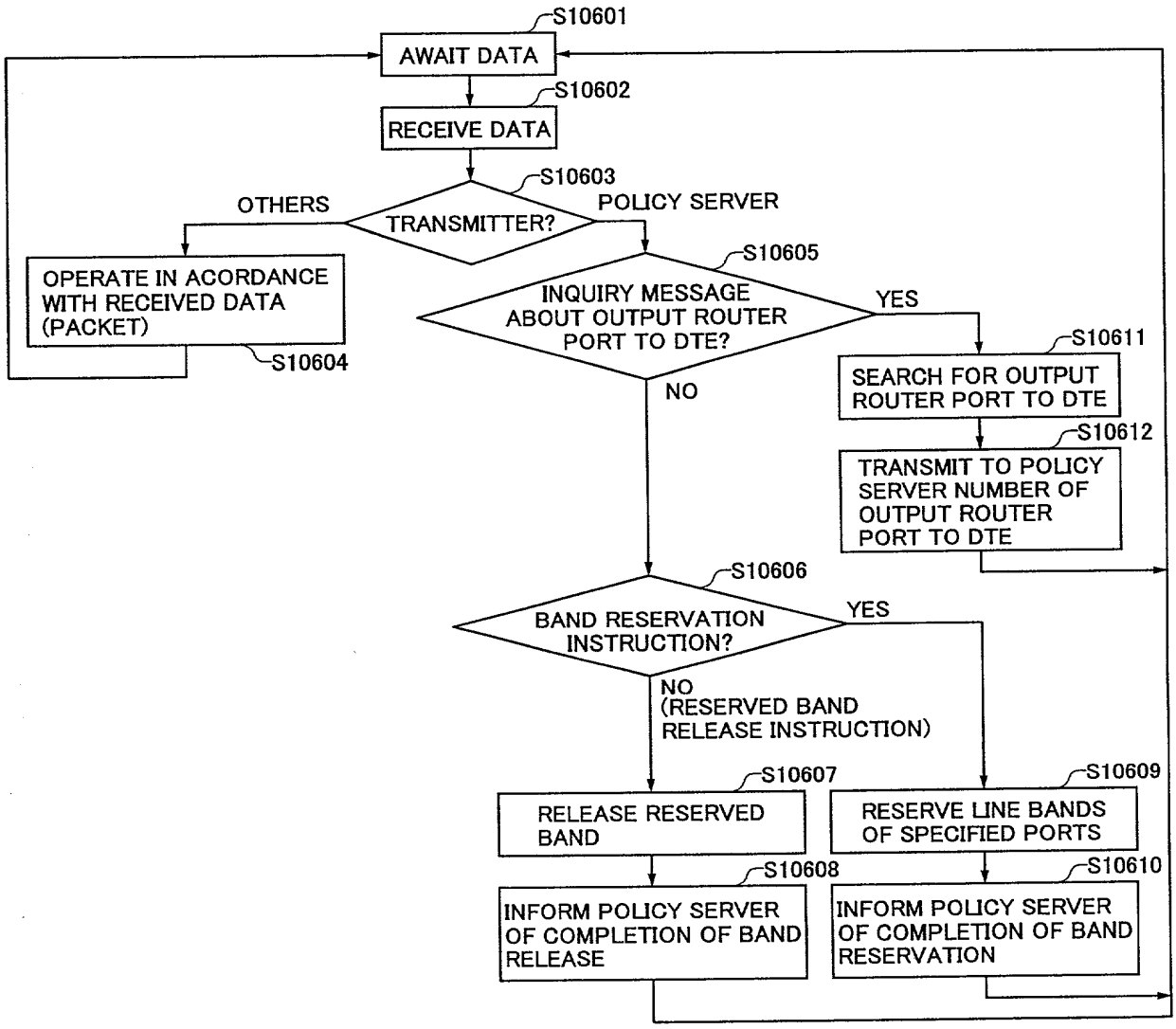

S10601
AWAIT DATA
S10602
RECEIVE DATA
S10603
TRANSMITTER?
OTHERS
POLICY SERVER
OPERATE IN ACORDANCE WITH RECEIVED DATA (PACKET)
S10604
S10605
INQUIRY MESSAGE ABOUT OUTPUT ROUTER PORT TO DTE?
YES
NO
S10611
SEARCH FOR OUTPUT ROUTER PORT TO DTE
S10612
TRANSMIT TO POLICY SERVER NUMBER OF OUTPUT ROUTER PORT TO DTE
S10606
BAND RESERVATION INSTRUCTION?
YES
NO (RESERVED BAND RELEASE INSTRUCTION)
S10607
RELEASE RESERVED BAND
S10609
RESERVE LINE BANDS OF SPECIFIED PORTS
S10608
INFORM POLICY SERVER OF COMPLETION OF BAND RELEASE
S10610
INFORM POLICY SERVER OF COMPLETION OF BAND RESERVATION

FIG.27A

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
136.10.0.1	130.10.0.2	(REQUESTED CONDITIONS)

FIG.27B

MIDDLEMAN SERVER IP ADDRESS
138.10.0.1

FIG.27C

CONTENT NAME	CAPACITY
CONTENT A	57.6M
CONTENT B	28.8M

FIG.27D

(a) $57.6\,(\text{Mbyte}) \times \dfrac{8\,(\text{bit})}{64\,(\text{Kbps})} = 7{,}200\,(\text{sec})$

(b) "2001/9/1 10:00"+"7,200(sec)"

(c) "2001/9/1 12:00"

FIG.27E

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α 1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	

FIG.27F

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
130.10.0.2	136.10.0.1	

FIG.28A

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 134.30.0.1	DATA

FIG.28B

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	134.30.0.1

FIG.28C

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 132.40.0.1	DATA

FIG.28D

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 130.30.0.1	DATA

FIG.29A

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	134.30.0.1
							132.40.0.1
							130.30.0.1

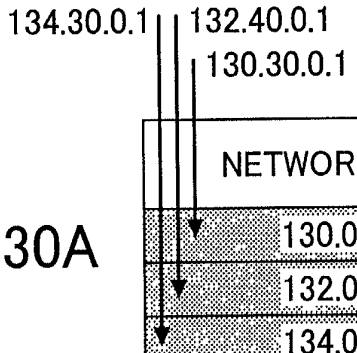
FIG.29B

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	134.30.0.1
							132.40.0.1
							130.30.0.1

FIG.29C

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
138.10.0.1	136.10.0.1	(α1 POLICY)

FIG.30A



NETWORK ADDRESS	POLICY SERVER IP ADDRESS	CLIENT MANAGEMENT SERVER IP ADDRESS
130.0.0.0/9	130.40.0.3	130.40.0.4
132.0.0.0/9	132.50.0.3	132.50.0.4
134.0.0.0/9	134.40.0.3	134.40.0.4

FIG.30B

ORDER RECEPTION NO.	POLICY SERVER IP ADDRESS	USER IP ADDRESS	CONTENT SERVER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS
β 1	134.40.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	134.30.0.1
β 2	132.50.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	132.40.0.1
β 3	130.40.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	130.30.0.1

FIG.31A

CONTENT SERVER IP ADDRESS	ORDER -ING NO.	ORDER RECEPTION NUMBER	POLICY SERVER IP ADDRESS	RESERVATION RESULT
136.10.0.1	α 1	β 1	134.40.0.3	
		β 2	132.50.0.3	
		β 3	130.40.0.3	

FIG.31B

ORDER RECEPTION NO.	POLICY SERVER IP ADDRESS	USER IP ADDRESS	CONTENT SERVER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS
β 1	134.40.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	134.30.0.1
β 2	132.50.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	132.40.0.1
β 3	130.40.0.3	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	130.30.0.1

FIG.31C

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
134.40.0.3	138.10.0.1	(β 1 POLICY FOR POLICY SERVER Pc)

FIG.31D

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
132.50.0.3	138.10.0.1	(β 2 POLICY FOR POLICY SERVER Pb)

FIG.31E

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
130.40.0.3	138.10.0.1	(β 3 POLICY FOR POLICY SERVER Pa)

FIG.32A

ROUTER PORT IP ADDRESS	ROUTER VIRTUAL IP ADDRESS
134.10.0.1	134.10.0.5
134.20.0.1	
134.30.0.1	
134.40.0.1	
134.50.0.1	134.50.0.5
134.60.0.1	
134.20.0.2	

FIG.32B

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β 1	134.10.0.5	

FIG.32C

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
134.10.0.5	134.40.0.3	(INQUIRY ABOUT ROUTER OUTPUT PORT TO USER IP ADDRESS OF NO.1 POLICY)

FIG.33A

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
134.40.0.3	134.10.0.5	(OUTPUT PORT P10 TO USER IP ADDRESS OF NO.1 POLICY)

FIG.33B

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β 1	134.10.0.5	P10

FIG.33C

RESIDUAL LINE BAND = 1Mbps − 64Kbps
= 0.936Mbps > 0

FIG.33D

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Rc	P10	1M	1M	1M	1M	1M	1M	0.936M	1M	1M	1M	1M	1M	1M
Rc	P11	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Rd	P14	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M
Rd	P16	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M

FIG.33E

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
138.10.0.1	134.40.0.3	(RESERVATION RESULT OF β1 POLICY "O")

FIG.34A

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β 1	134.10.0.5	P10

FIG.34B

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
134.10.0.5	134.40.0.3	(INSTRUCTION TO SET NO.1 POLICY)

FIG.34C

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
134.40.0.3	134.10.0.5	(COMPLETION OF SETTING OF NO.1 POLICY)

FIG.34D

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
138.10.0.1	132.50.0.3	(RESERVATION RESULT OF β 2 POLICY "O")

FIG.34E

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
138.10.0.1	130.40.0.3	(RESERVATION RESULT OF β 3 POLICY "O")

FIG.35A

CONTENT SERVER IP ADDRESS	ORDER -ING NO.	ORDER RECEPTION NUMBER	POLICY SERVER IP ADDRESS	RESERVATION RESULT
136.10.0.1	α 1	β 1	134.40.0.3	○
		β 2	132.50.0.3	○
		β 3	130.40.0.3	○

FIG.35B

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
136.10.0.1	138.10.0.1	(GENERAL DETERMINATION RESULT OF α1 POLICY "○")

FIG.35C

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
130.10.0.2	136.10.0.1	(COMPLETION OF RESERVATION)

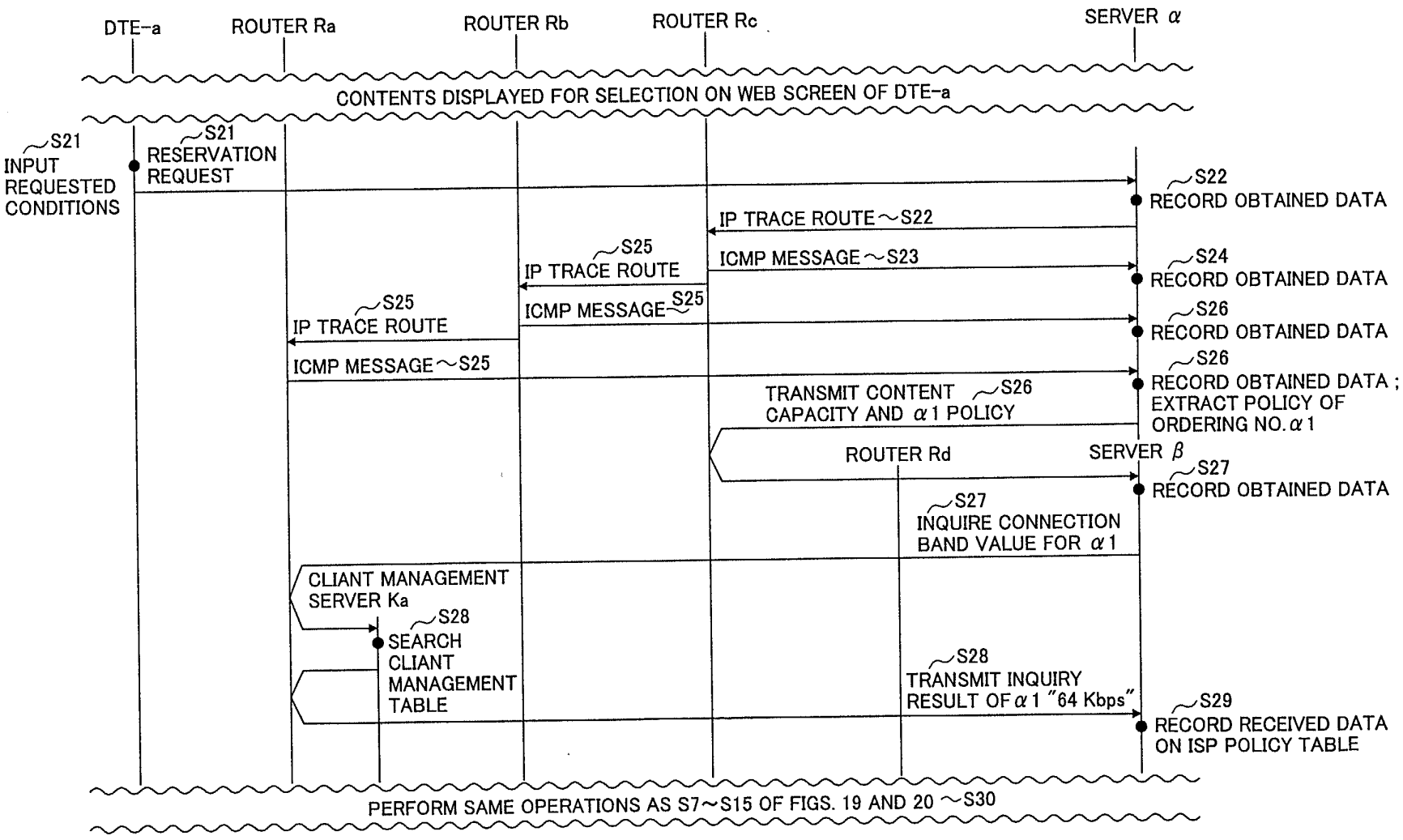

DTE-a
ROUTER Ra
ROUTER Rb
ROUTER Rc
SERVER α
CONTENTS DISPLAYED FOR SELECTION ON WEB SCREEN OF DTE-a
S21
INPUT REQUESTED CONDITIONS
S21
RESERVATION REQUEST
S22
RECORD OBTAINED DATA
IP TRACE ROUTE ~S22
S25
IP TRACE ROUTE
ICMP MESSAGE ~S23
S24
RECORD OBTAINED DATA
S25
IP TRACE ROUTE
ICMP MESSAGE S25
S26
RECORD OBTAINED DATA
ICMP MESSAGE ~S25
S26
RECORD OBTAINED DATA ; EXTRACT POLICY OF ORDERING NO. α1
TRANSMIT CONTENT CAPACITY AND α1 POLICY S26
ROUTER Rd
SERVER β
S27
RECORD OBTAINED DATA
S27
INQUIRE CONNECTION BAND VALUE FOR α1
CLIANT MANAGEMENT SERVER Ka
S28
SEARCH CLIANT MANAGEMENT TABLE
S28
TRANSMIT INQUIRY RESULT OF α1 "64 Kbps"
S29
RECORD RECEIVED DATA ON ISP POLICY TABLE
PERFORM SAME OPERATIONS AS S7~S15 OF FIGS. 19 AND 20 ~S30

FIG.37

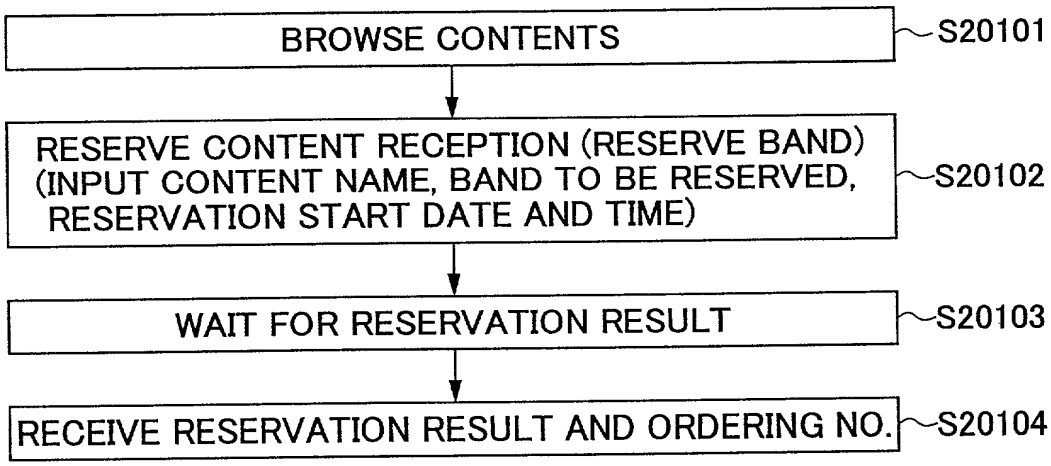

BROWSE CONTENTS
S20101
RESERVE CONTENT RECEPTION (RESERVE BAND)
(INPUT CONTENT NAME, BAND TO BE RESERVED,
RESERVATION START DATE AND TIME)
S20102
WAIT FOR RESERVATION RESULT
S20103
RECEIVE RESERVATION RESULT AND ORDERING NO.
S20104

FIG.38

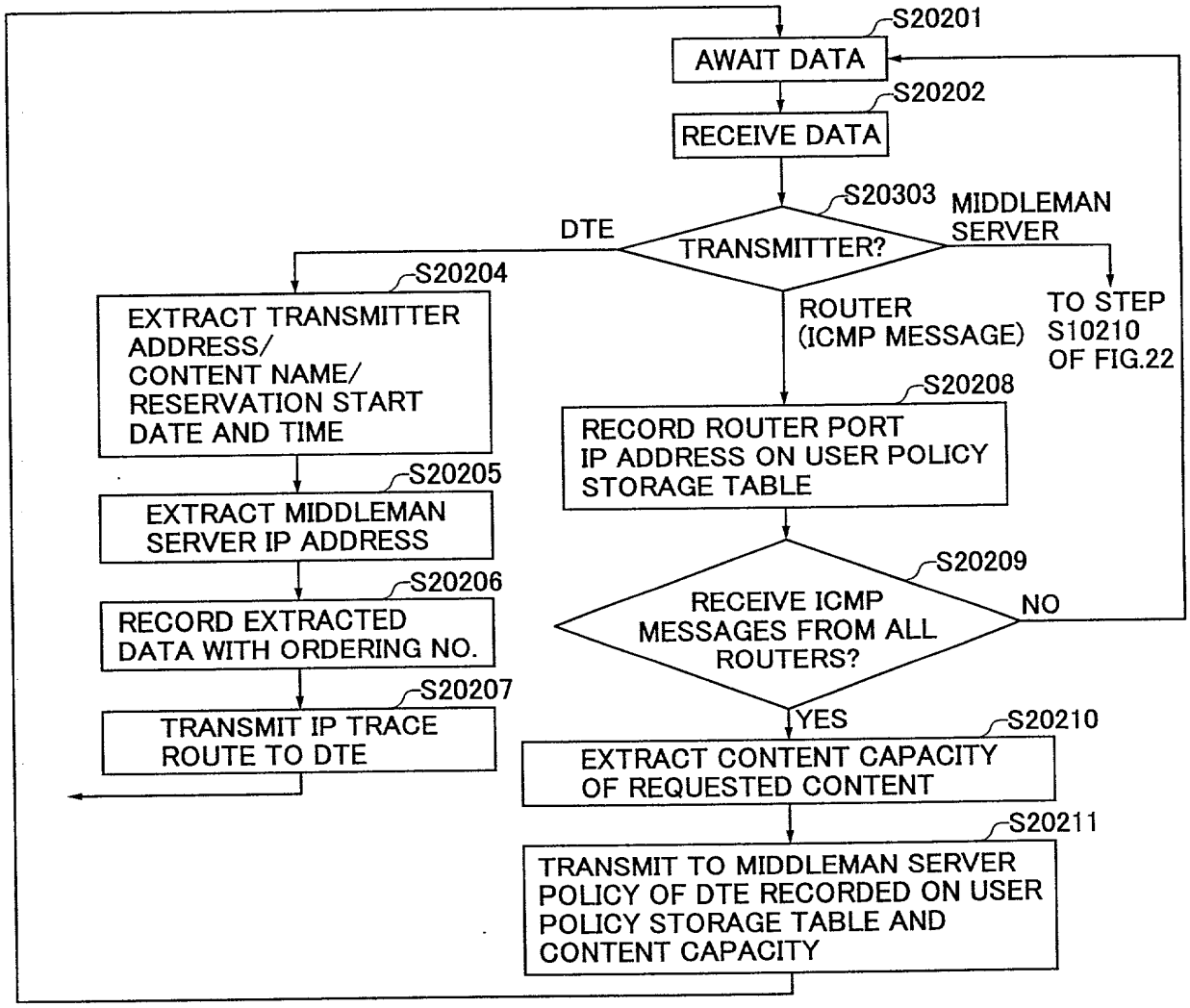

S20201
AWAIT DATA
S20202
RECEIVE DATA
S20303
TRANSMITTER?
DTE
MIDDLEMAN SERVER
S20204
EXTRACT TRANSMITTER ADDRESS/ CONTENT NAME/ RESERVATION START DATE AND TIME
S20205
EXTRACT MIDDLEMAN SERVER IP ADDRESS
S20206
RECORD EXTRACTED DATA WITH ORDERING NO.
S20207
TRANSMIT IP TRACE ROUTE TO DTE
ROUTER (ICMP MESSAGE)
TO STEP S10210 OF FIG.22
S20208
RECORD ROUTER PORT IP ADDRESS ON USER POLICY STORAGE TABLE
S20209
RECEIVE ICMP MESSAGES FROM ALL ROUTERS?
NO
YES
S20210
EXTRACT CONTENT CAPACITY OF REQUESTED CONTENT
S20211
TRANSMIT TO MIDDLEMAN SERVER POLICY OF DTE RECORDED ON USER POLICY STORAGE TABLE AND CONTENT CAPACITY

FIG.39

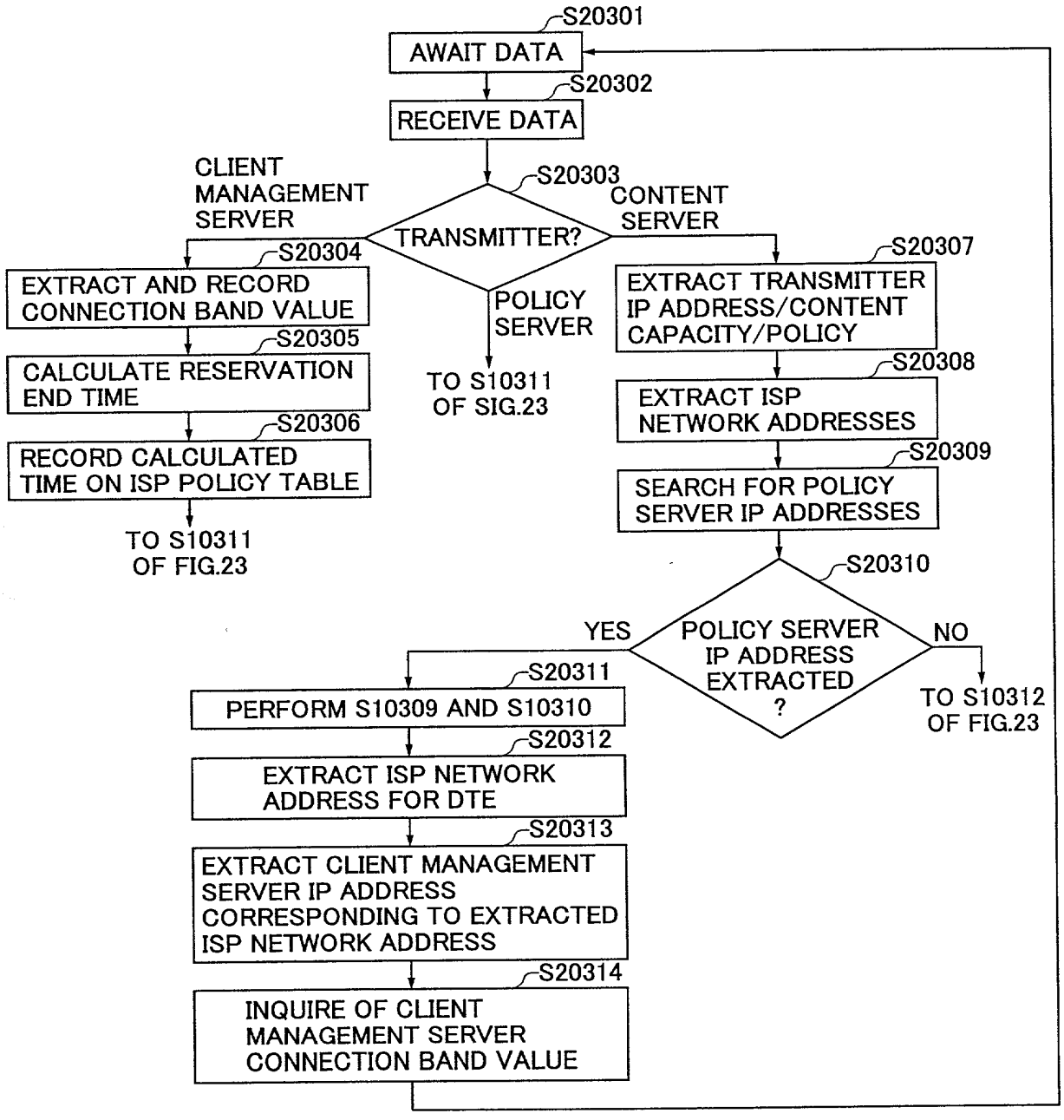

S20301
AWAIT DATA
S20302
RECEIVE DATA
S20303
TRANSMITTER?
CLIENT MANAGEMENT SERVER
CONTENT SERVER
POLICY SERVER
S20304
EXTRACT AND RECORD CONNECTION BAND VALUE
S20305
CALCULATE RESERVATION END TIME
S20306
RECORD CALCULATED TIME ON ISP POLICY TABLE
TO S10311 OF FIG.23
TO S10311 OF SIG.23
S20307
EXTRACT TRANSMITTER IP ADDRESS/CONTENT CAPACITY/POLICY
S20308
EXTRACT ISP NETWORK ADDRESSES
S20309
SEARCH FOR POLICY SERVER IP ADDRESSES
S20310
POLICY SERVER IP ADDRESS EXTRACTED ?
YES
NO
TO S10312 OF FIG.23
S20311
PERFORM S10309 AND S10310
S20312
EXTRACT ISP NETWORK ADDRESS FOR DTE
S20313
EXTRACT CLIENT MANAGEMENT SERVER IP ADDRESS CORRESPONDING TO EXTRACTED ISP NETWORK ADDRESS
S20314
INQUIRE OF CLIENT MANAGEMENT SERVER CONNECTION BAND VALUE

FIG.40

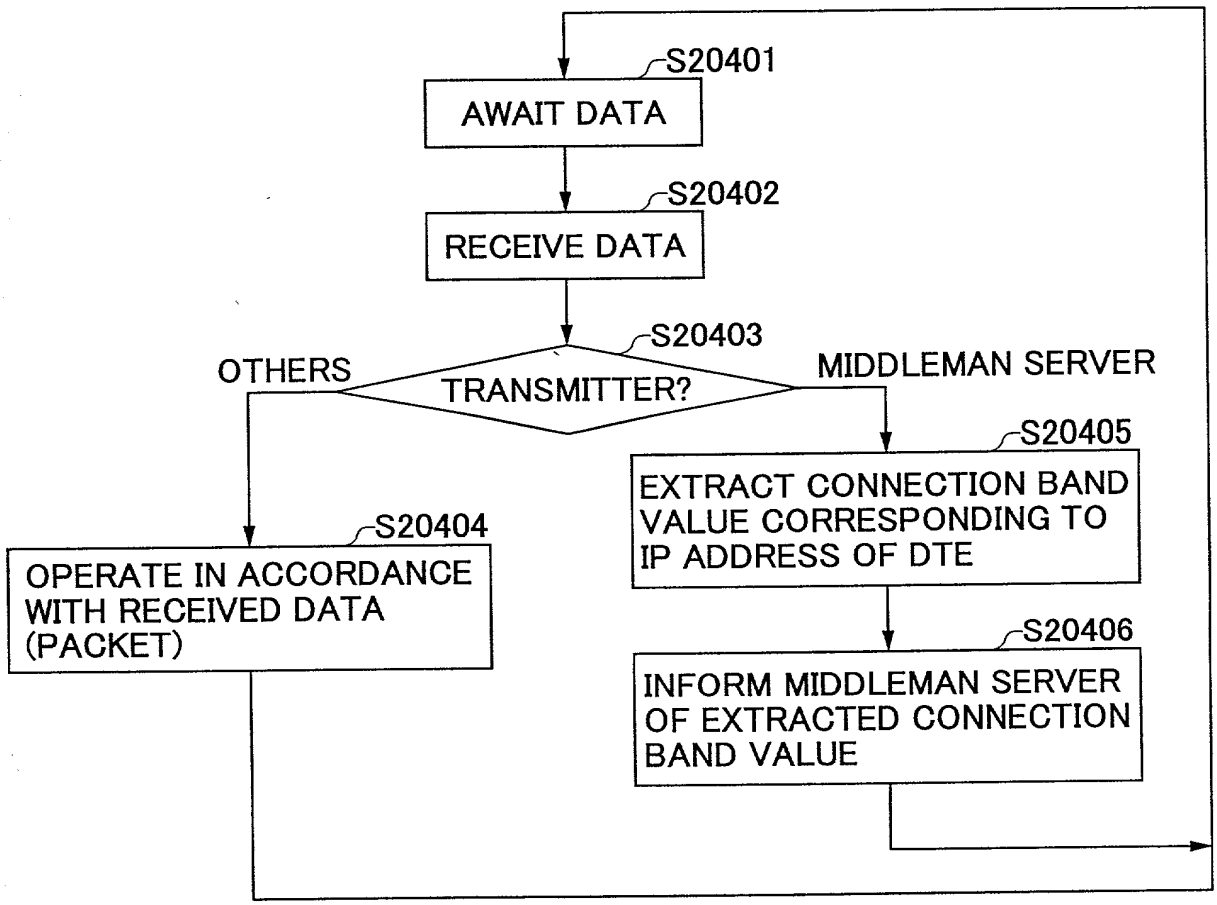

S20401
AWAIT DATA
S20402
RECEIVE DATA
S20403
TRANSMITTER?
OTHERS
MIDDLEMAN SERVER
S20404
OPERATE IN ACCORDANCE WITH RECEIVED DATA (PACKET)
S20405
EXTRACT CONNECTION BAND VALUE CORRESPONDING TO IP ADDRESS OF DTE
S20406
INFORM MIDDLEMAN SERVER OF EXTRACTED CONNECTION BAND VALUE

FIG.41A

USER IP ADDRESS	CONNECTION BAND (bps)
130.10.0.2	64K
130.20.0.2	128K
130.10.0.3	

FIG.41B

USER IP ADDRESS	CONNECTION BAND (bps)
132.30.0.2	128K

FIG.41C

USER IP ADDRESS	CONNECTION BAND (bps)

FIG.42A

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
136.10.0.1	130.10.0.2	(REQUESTED CONDITIONS)

FIG.42B

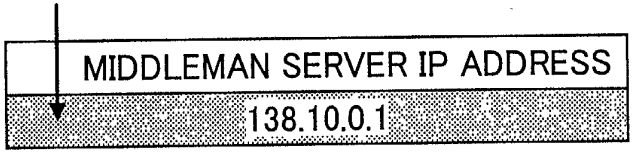


FIG.42C

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2		2001/9/1 10:00		

FIG.42D

DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	DATA
130.10.0.2	136.10.0.1	

FIG.43A

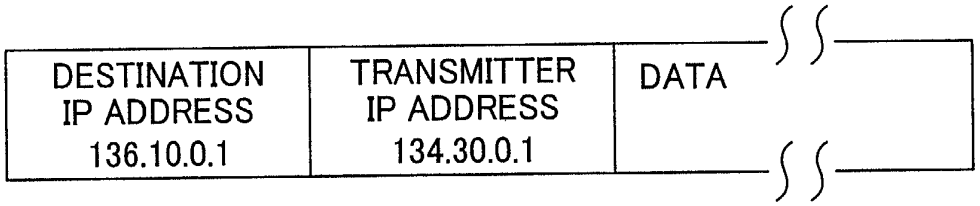


FIG.43B

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2		2001/9/1 10:00		134.30.0.1

FIG.43C

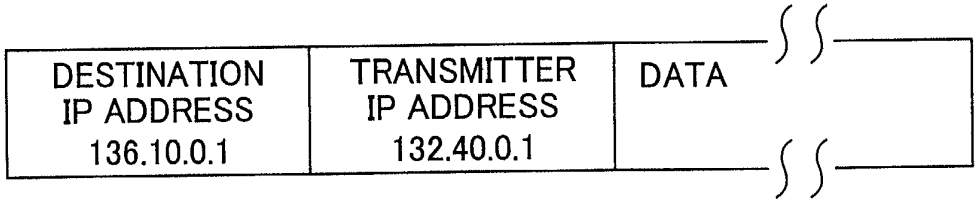


FIG.43D

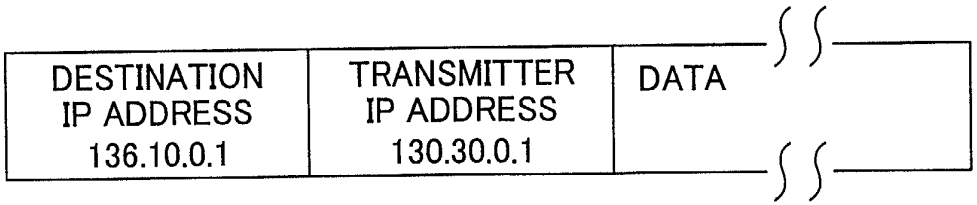


FIG.44A

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2		2000/9/1 10:00		134.30.0.1
							132.40.0.1
							130.30.0.1

FIG.44B

CONTENT NAME	CAPACITY (byte)
CONTENT A	57.6M
CONTENT B	28.8M

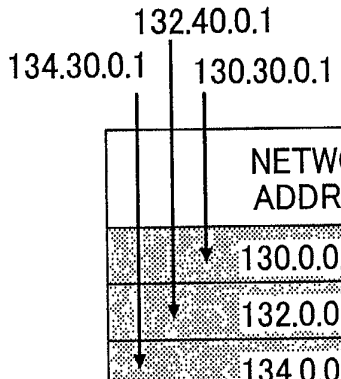
FIG.44C

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2		2000/9/1 10:00		134.30.0.1
							132.40.0.1
							130.30.0.1

FIG.44D

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 136.10.0.1	DATA (CONTENT CAPACITY, α1 POLICY)

FIG.45A



NETWORK ADDRESS	POLICY SERVER IP ADDRESS	CLIENT MANAGEMENT SERVER IP ADDRESS
130.0.0.0/9	130.40.0.3	130.40.0.4
132.0.0.0/9	132.50.0.3	132.50.0.4
134.0.0.0/9	134.40.0.3	134.40.0.4

FIG.45B

ORDER RECEPTION NO.	POLICY SERVER IP ADDRESS	USER IP ADDRESS	CONTENT SERVER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS
β1	134.40.0.3	130.10.0.2	136.10.0.1		2000/9/1 10:00		134.30.0.1
β2	132.50.0.3	130.10.0.2	136.10.0.1		2000/9/1 10:00		132.40.0.1
β3	130.40.0.3	130.10.0.2	136.10.0.1		2000/9/1 10:00		130.30.0.1

FIG.45C

CONTENT SERVER IP ADDRESS	ORDERING NO.	ORDER RECEPTION NUMBER	POLICY SERVER IP ADDRESS	RESERVATION RESULT
136.10.0.1	α 1	β 1	134.40.0.3	
		β 2	132.50.0.3	
		β 3	130.40.0.3	

FIG.45D

NETWORK ADDRESS	POLICY SERVER IP ADDRESS	CLIENT MANAGEMENT SERVER IP ADDRESS
130.0.0.0/9	130.40.0.3	130.40.0.4
132.0.0.0/9	132.50.0.3	132.50.0.4
134.0.0.0/9	134.40.0.3	134.40.0.4

FIG.45E

DESTINATION IP ADDRESS 130.40.0.4	TRANSMITTER IP ADDRESS 138.10.0.1	DATA (ORDERING NO., USER IP ADDRESS, INQUIRY ABOUT CONNECTION BAND)

FIG.46A

USER IP ADDRESS	CONNECITON BAND (bps)
130.10.0.2	64K
130.20.0.2	128K
130.10.0.3	

FIG.46B

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 130.40.0.4	DATA (ORDERING NO., CONNECTION BAND“64Kbps”)

FIG.46C

(a) $57.6(\text{Mbyte}) \times \frac{8\ (\text{bit})}{64(\text{Kbps})} = 7{,}200\ (\text{sec})$

(b) "2001/9/1 10:00" + "7,200(sec)"

(c) "2001/9/1 12:00"

FIG.46D

ORDER RECEPTION NO.	POLICY SERVER IP ADDRESS	USER IP ADDRESS	CONTENT SERVER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS
β 1	134.40.0.3	130.10.0.2	136.10.0.1	64K	2000/9/1 10:00	2000/9/1 12:00	134.30.0.1
β 2	132.50.0.3	130.10.0.2	136.10.0.1	64K	2000/9/1 10:00	2000/9/1 12:00	132.40.0.1
β 3	130.40.0.3	130.10.0.2	136.10.0.1	64K	2000/9/1 10:00	2000/9/1 12:00	130.30.0.1

FIG.47

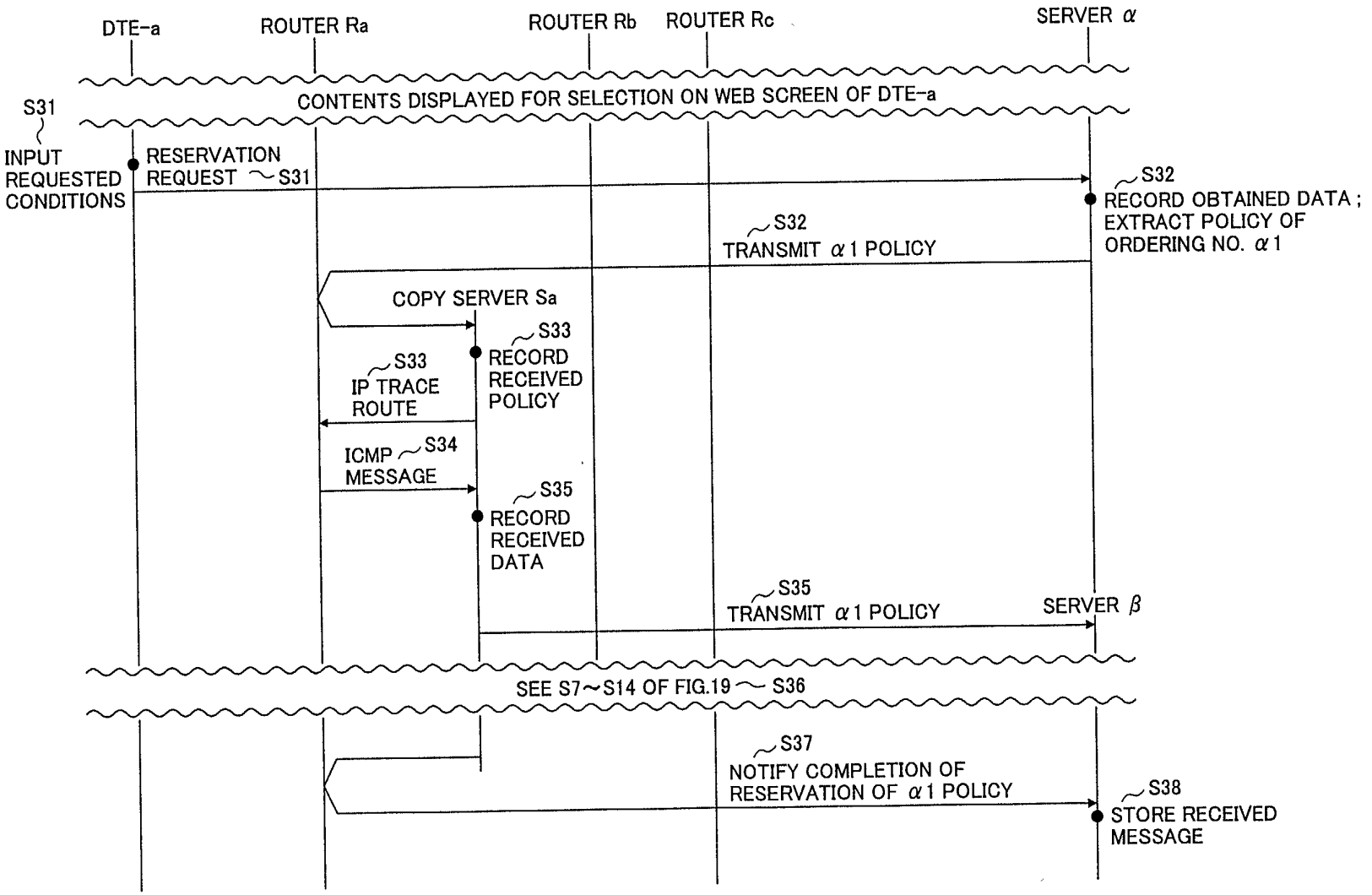

DTE-a
ROUTER Ra
ROUTER Rb
ROUTER Rc
SERVER α
CONTENTS DISPLAYED FOR SELECTION ON WEB SCREEN OF DTE-a
S31
INPUT REQUESTED CONDITIONS
RESERVATION REQUEST
S31
S32
RECORD OBTAINED DATA ; EXTRACT POLICY OF ORDERING NO. α1
S32
TRANSMIT α1 POLICY
COPY SERVER Sa
S33
RECORD RECEIVED POLICY
S33
IP TRACE ROUTE
ICMP MESSAGE
S34
S35
RECORD RECEIVED DATA
S35
TRANSMIT α1 POLICY
SERVER β
SEE S7~S14 OF FIG.19
S36
S37
NOTIFY COMPLETION OF RESERVATION OF α1 POLICY
S38
STORE RECEIVED MESSAGE

FIG.48

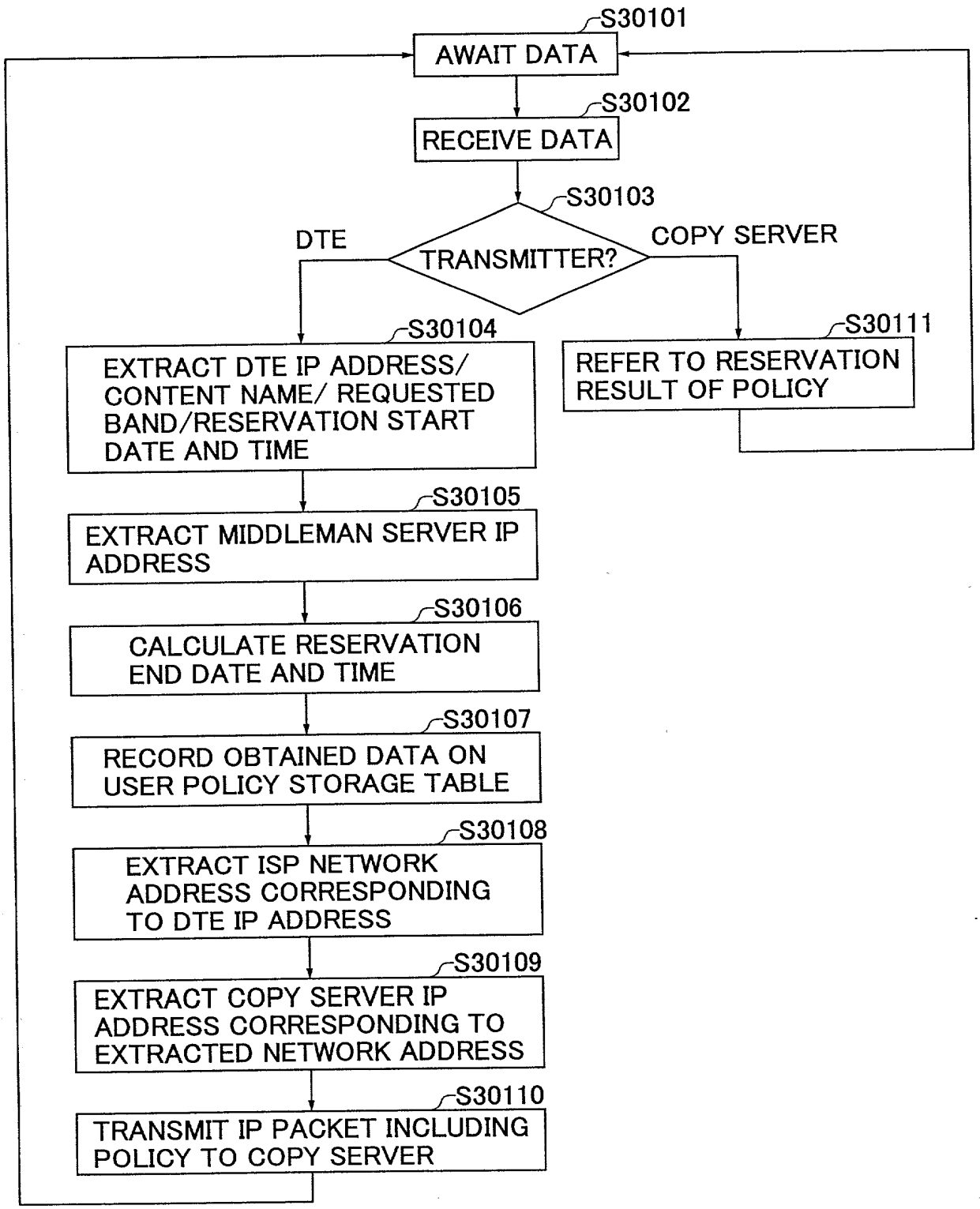

S30101
AWAIT DATA
S30102
RECEIVE DATA
S30103
TRANSMITTER?
DTE
COPY SERVER
S30104
EXTRACT DTE IP ADDRESS/ CONTENT NAME/ REQUESTED BAND/RESERVATION START DATE AND TIME
S30111
REFER TO RESERVATION RESULT OF POLICY
S30105
EXTRACT MIDDLEMAN SERVER IP ADDRESS
S30106
CALCULATE RESERVATION END DATE AND TIME
S30107
RECORD OBTAINED DATA ON USER POLICY STORAGE TABLE
S30108
EXTRACT ISP NETWORK ADDRESS CORRESPONDING TO DTE IP ADDRESS
S30109
EXTRACT COPY SERVER IP ADDRESS CORRESPONDING TO EXTRACTED NETWORK ADDRESS
S30110
TRANSMIT IP PACKET INCLUDING POLICY TO COPY SERVER

FIG.49

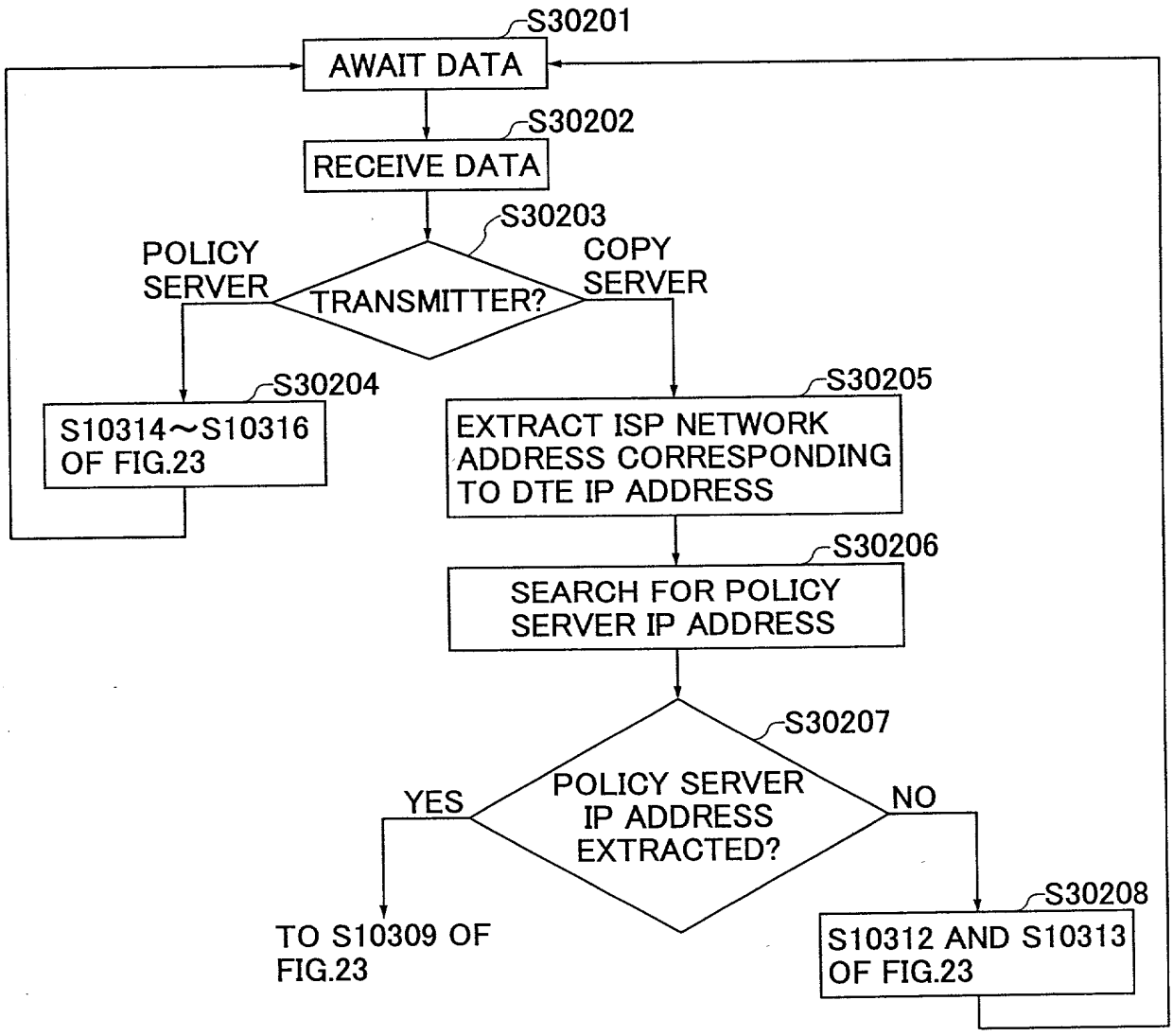

S30201
AWAIT DATA
S30202
RECEIVE DATA
S30203
POLICY SERVER
TRANSMITTER?
COPY SERVER
S30204
S10314～S10316 OF FIG.23
S30205
EXTRACT ISP NETWORK ADDRESS CORRESPONDING TO DTE IP ADDRESS
S30206
SEARCH FOR POLICY SERVER IP ADDRESS
S30207
POLICY SERVER IP ADDRESS EXTRACTED?
YES
NO
TO S10309 OF FIG.23
S30208
S10312 AND S10313 OF FIG.23

FIG.50

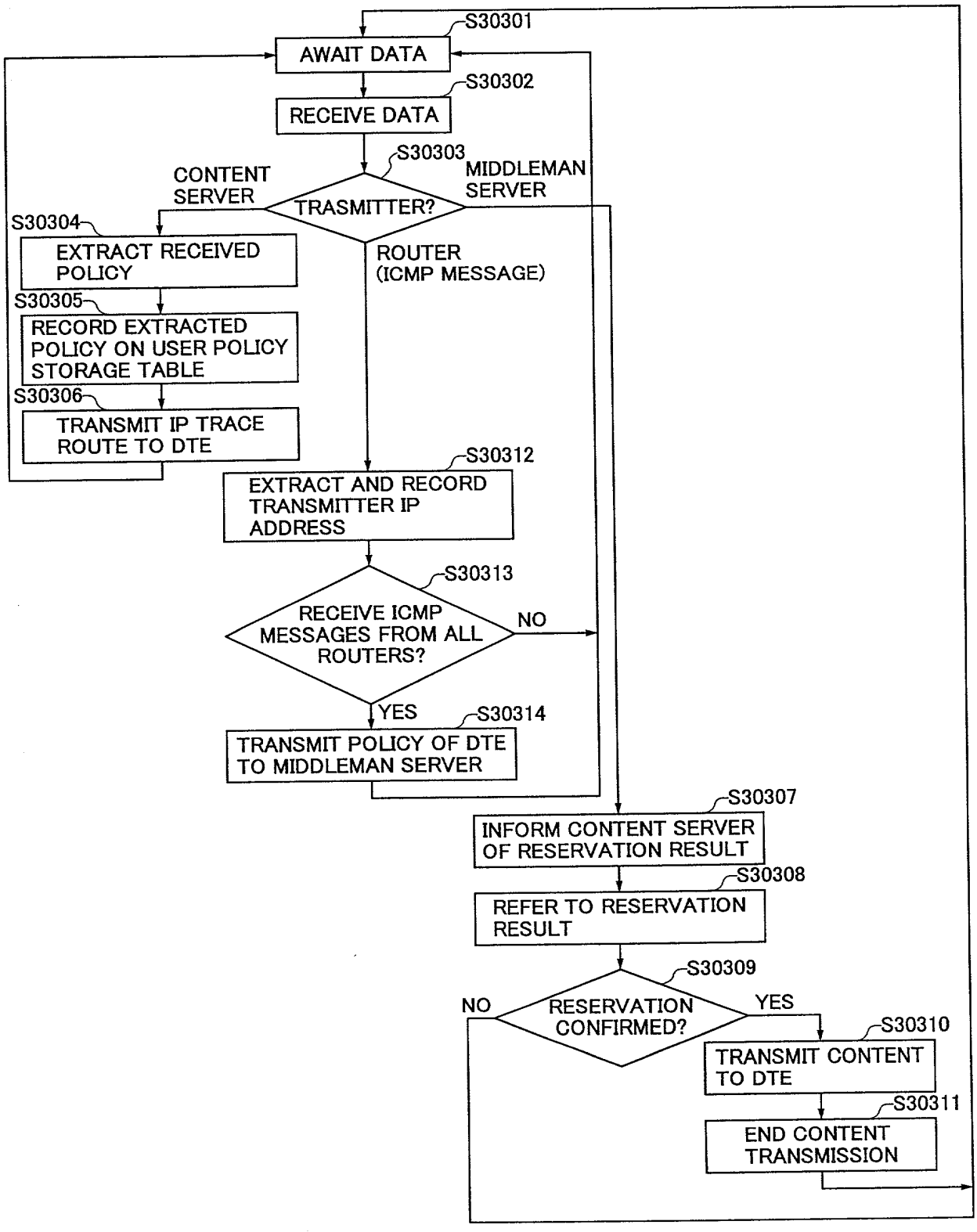

S30301
AWAIT DATA
S30302
RECEIVE DATA
S30303
CONTENT SERVER
TRASMITTER?
MIDDLEMAN SERVER
S30304
EXTRACT RECEIVED POLICY
ROUTER (ICMP MESSAGE)
S30305
RECORD EXTRACTED POLICY ON USER POLICY STORAGE TABLE
S30306
TRANSMIT IP TRACE ROUTE TO DTE
S30312
EXTRACT AND RECORD TRANSMITTER IP ADDRESS
S30313
RECEIVE ICMP MESSAGES FROM ALL ROUTERS?
NO
YES
S30314
TRANSMIT POLICY OF DTE TO MIDDLEMAN SERVER
S30307
INFORM CONTENT SERVER OF RESERVATION RESULT
S30308
REFER TO RESERVATION RESULT
S30309
NO
RESERVATION CONFIRMED?
YES
S30310
TRANSMIT CONTENT TO DTE
S30311
END CONTENT TRANSMISSION

FIG.51A

NETWORK ADDRESS	COPY SERVER IP ADDRESS
130.0.0.0/9	130.40.0.2
132.0.0.0/9	132.50.0.2
134.0.0.0/9	134.40.0.2

FIG.51B

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)

FIG.52

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 130.10.0.2	DATA (REQUESTED CONDITIONS)

FIG.53A

MIDDLEMAN SERVER IP ADDRESS
138.10.0.1

FIG.53B

CONTENT NAME	CAPACITY (byte)
CONTENT A	57.6M
CONTENT B	28.8M

FIG.53C

(a) $57.6(\text{Mbyte}) \times \frac{8\ (\text{bit})}{64(\text{Kbps})} = 7{,}200\ (\text{sec})$

(b) "2001/9/1 10:00" + "7,200(sec)"

(c) "2001/9/1 12:00"

FIG.53D

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	

FIG.53E

NETWORK ADDRESS	COPY SERVER IP ADDRESS
130.0.0.0/9	130.40.0.2
132.0.0.0/9	132.50.0.2
134.0.0.0/9	134.40.0.2

FIG.53F

DESTINATION IP ADDRESS 130.40.0.2	TRANSMITTER IP ADDRESS 136.10.0.1	DATA (α1 POLICY)

FIG.54A

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	

FIG.54B

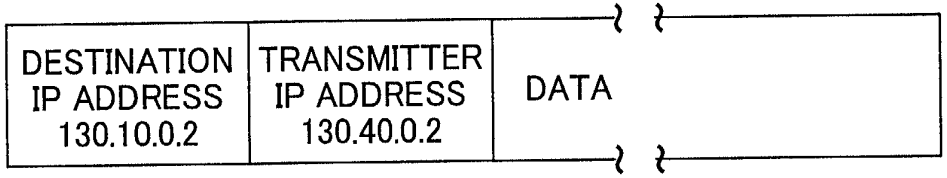


FIG.54C

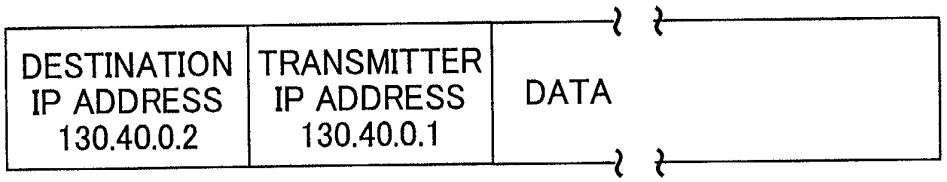


FIG.54D

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2001/9/1 10:00	2001/9/1 12:00	130.40.0.1

FIG.54E

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 130.40.0.4	DATA (COMPLETION OF α1 POLICY RESERVATION)

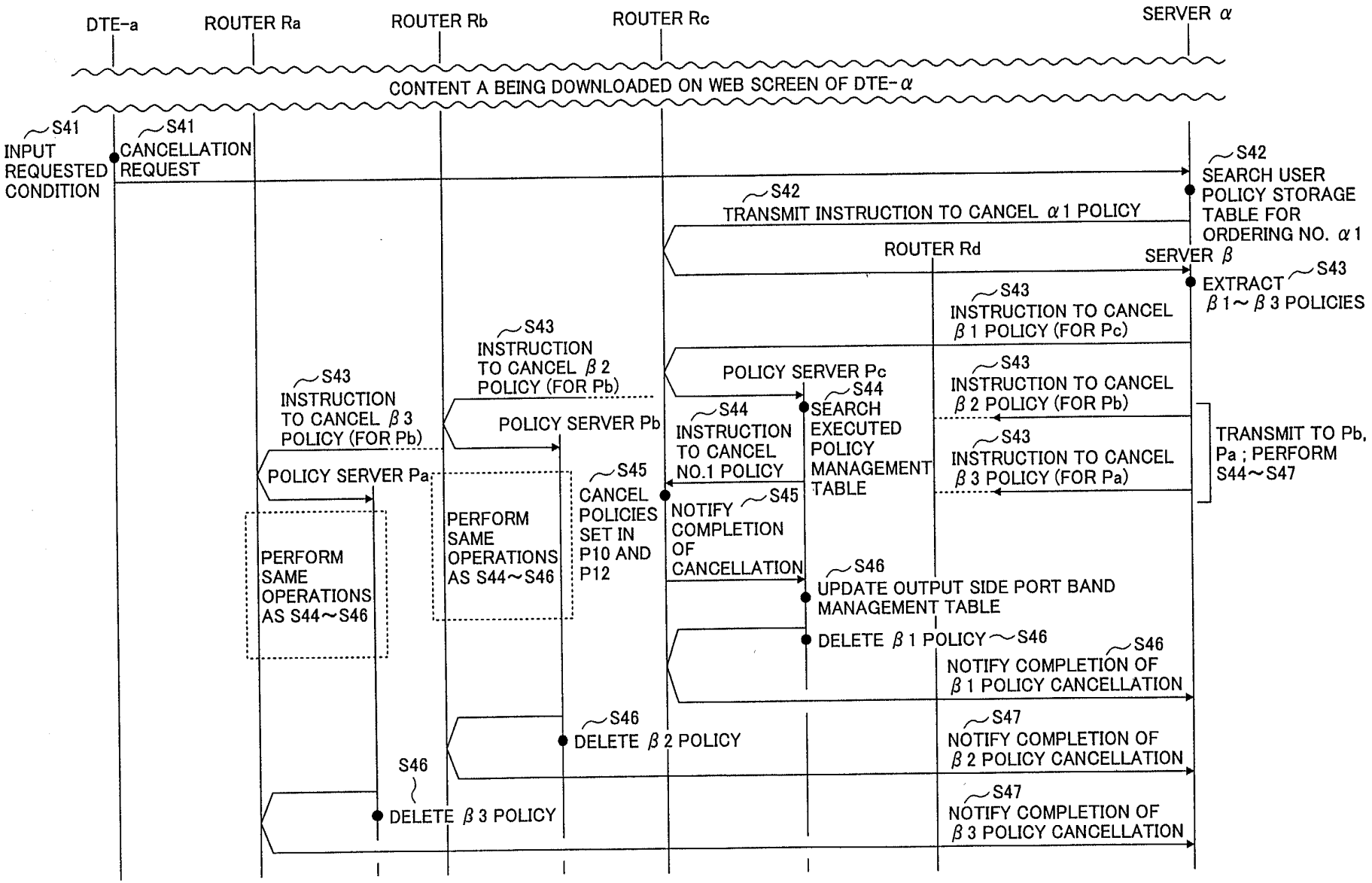

DTE-a
ROUTER Ra
ROUTER Rb
ROUTER Rc
SERVER α
CONTENT A BEING DOWNLOADED ON WEB SCREEN OF DTE-α
S41
INPUT REQUESTED CONDITION
S41
CANCELLATION REQUEST
S42
SEARCH USER POLICY STORAGE TABLE FOR ORDERING NO. α1
S42
TRANSMIT INSTRUCTION TO CANCEL α1 POLICY
ROUTER Rd
SERVER β
S43
EXTRACT β1～β3 POLICIES
S43
INSTRUCTION TO CANCEL β1 POLICY (FOR Pc)
S43
INSTRUCTION TO CANCEL β2 POLICY (FOR Pb)
S43
INSTRUCTION TO CANCEL β3 POLICY (FOR Pb)
POLICY SERVER Pc
S44
SEARCH EXECUTED POLICY MANAGEMENT TABLE
POLICY SERVER Pb
S44
INSTRUCTION TO CANCEL NO.1 POLICY
S43
INSTRUCTION TO CANCEL β3 POLICY (FOR Pa)
TRANSMIT TO Pb, Pa ; PERFORM S44～S47
POLICY SERVER Pa
S45
CANCEL POLICIES SET IN P10 AND P12
S45
NOTIFY COMPLETION OF CANCELLATION
PERFORM SAME OPERATIONS AS S44～S46
PERFORM SAME OPERATIONS AS S44～S46
S46
UPDATE OUTPUT SIDE PORT BAND MANAGEMENT TABLE
DELETE β1 POLICY
S46
NOTIFY COMPLETION OF β1 POLICY CANCELLATION
S46
DELETE β2 POLICY
S47
NOTIFY COMPLETION OF β2 POLICY CANCELLATION
S46
DELETE β3 POLICY
S47
NOTIFY COMPLETION OF β3 POLICY CANCELLATION

FIG.56

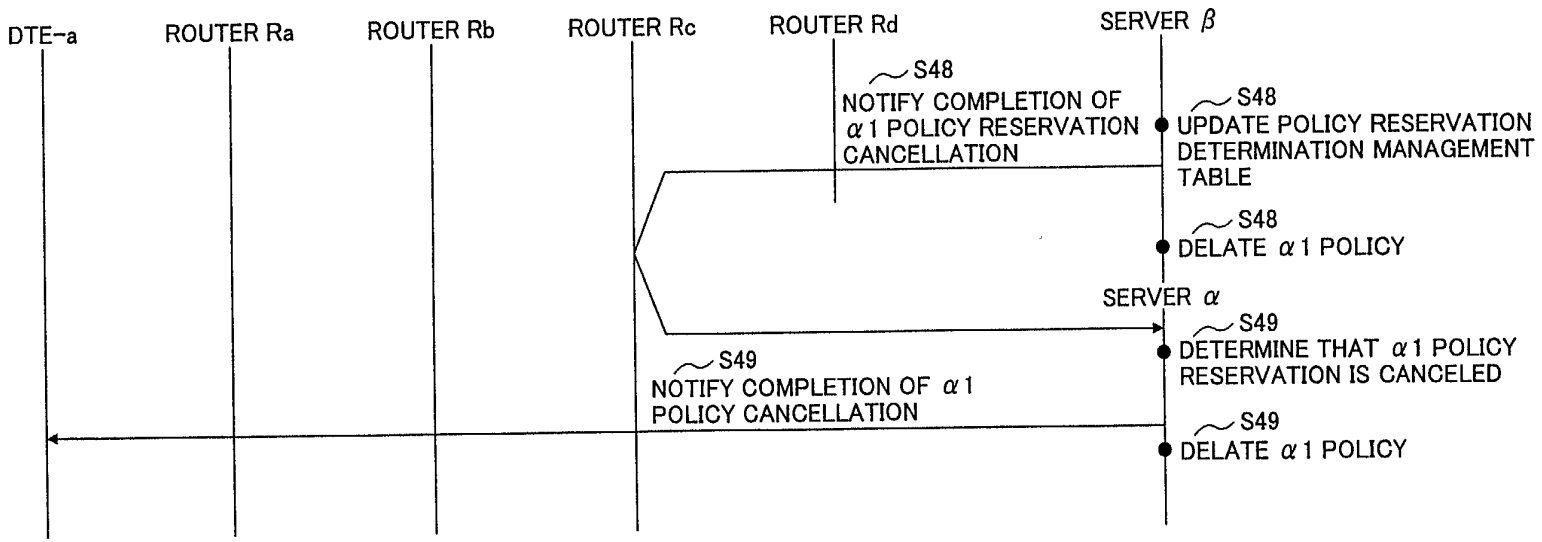

DTE-a
ROUTER Ra
ROUTER Rb
ROUTER Rc
ROUTER Rd
SERVER β
S48
NOTIFY COMPLETION OF α1 POLICY RESERVATION CANCELLATION
S48
UPDATE POLICY RESERVATION DETERMINATION MANAGEMENT TABLE
S48
DELATE α1 POLICY
SERVER α
S49
DETERMINE THAT α1 POLICY RESERVATION IS CANCELED
S49
NOTIFY COMPLETION OF α1 POLICY CANCELLATION
S49
DELATE α1 POLICY

FIG.57

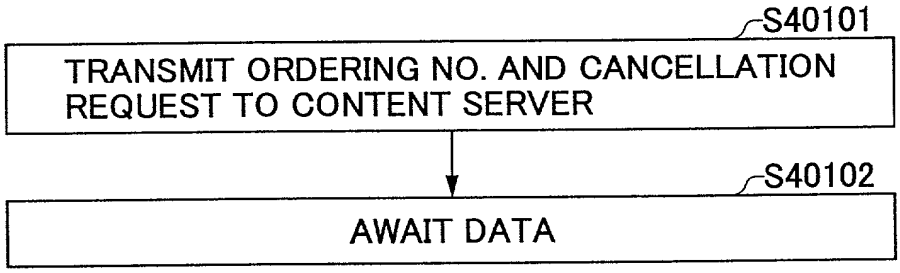

S40101
TRANSMIT ORDERING NO. AND CANCELLATION REQUEST TO CONTENT SERVER
S40102
AWAIT DATA

FIG.58

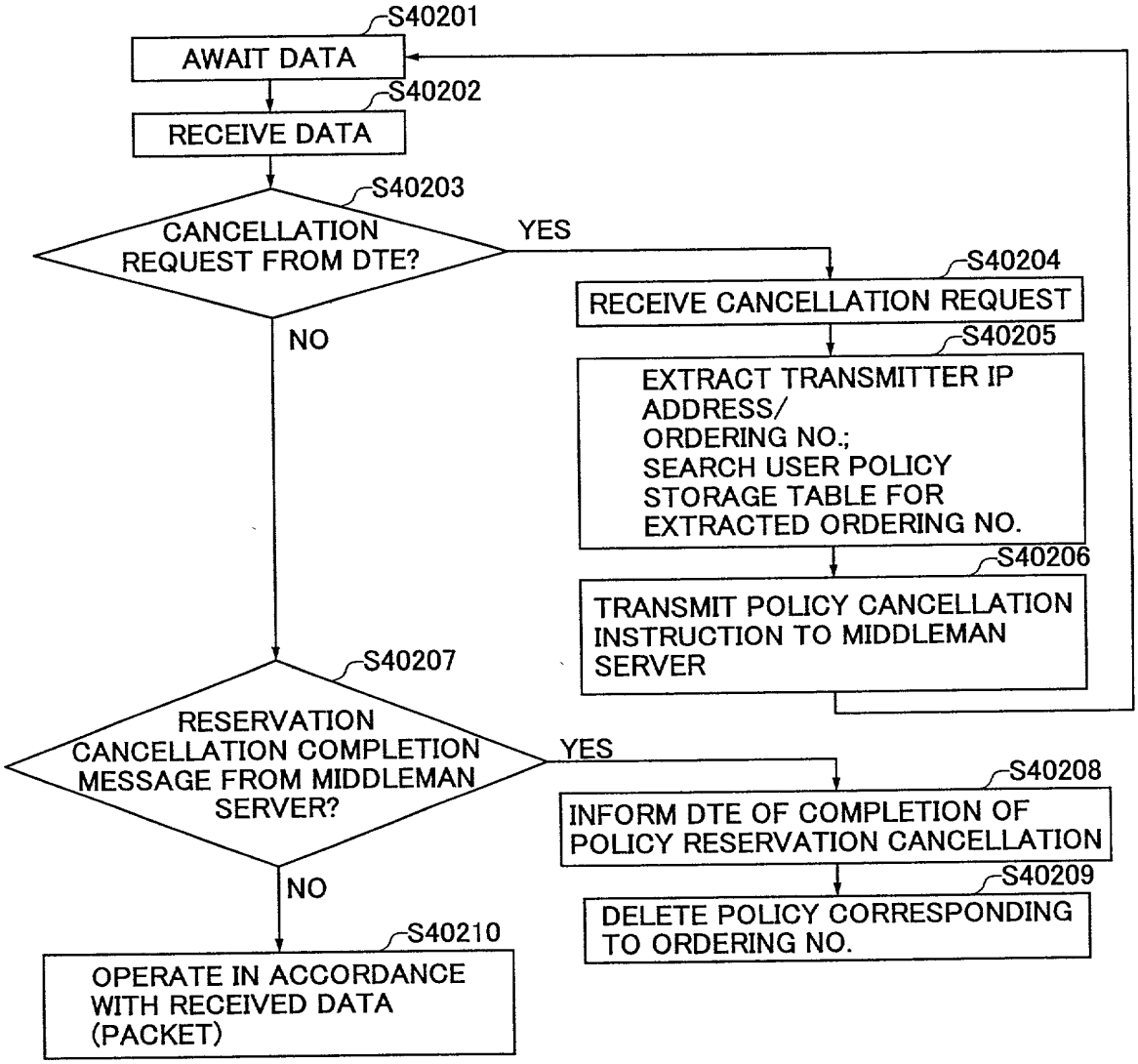

S40201
AWAIT DATA
S40202
RECEIVE DATA
S40203
CANCELLATION REQUEST FROM DTE?
YES
NO
S40204
RECEIVE CANCELLATION REQUEST
S40205
EXTRACT TRANSMITTER IP ADDRESS/ ORDERING NO.; SEARCH USER POLICY STORAGE TABLE FOR EXTRACTED ORDERING NO.
S40206
TRANSMIT POLICY CANCELLATION INSTRUCTION TO MIDDLEMAN SERVER
S40207
RESERVATION CANCELLATION COMPLETION MESSAGE FROM MIDDLEMAN SERVER?
YES
NO
S40208
INFORM DTE OF COMPLETION OF POLICY RESERVATION CANCELLATION
S40209
DELETE POLICY CORRESPONDING TO ORDERING NO.
S40210
OPERATE IN ACCORDANCE WITH RECEIVED DATA (PACKET)

FIG.59

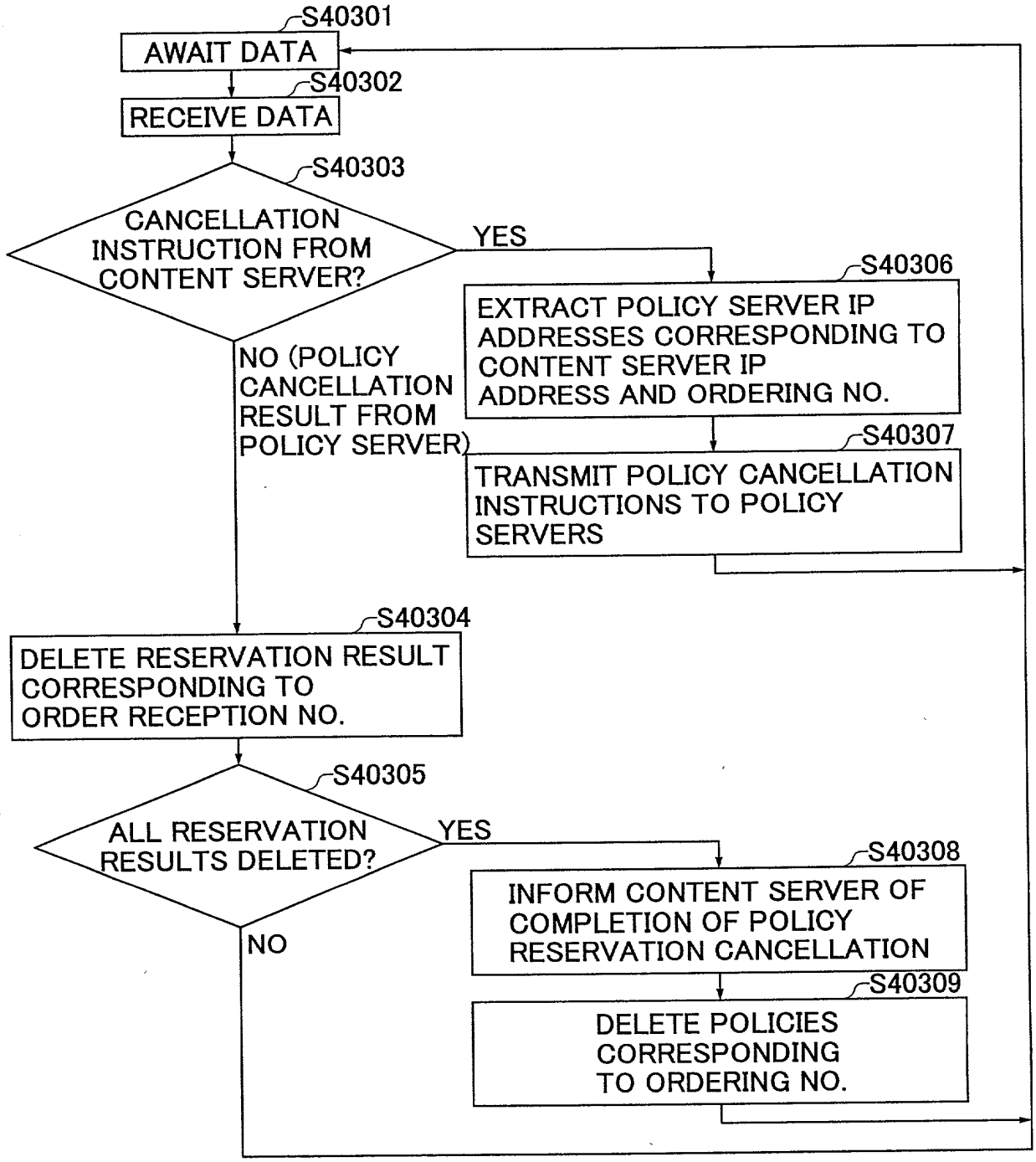

S40301
AWAIT DATA
S40302
RECEIVE DATA
S40303
CANCELLATION INSTRUCTION FROM CONTENT SERVER?
YES
S40306
EXTRACT POLICY SERVER IP ADDRESSES CORRESPONDING TO CONTENT SERVER IP ADDRESS AND ORDERING NO.
S40307
TRANSMIT POLICY CANCELLATION INSTRUCTIONS TO POLICY SERVERS
NO (POLICY CANCELLATION RESULT FROM POLICY SERVER)
S40304
DELETE RESERVATION RESULT CORRESPONDING TO ORDER RECEPTION NO.
S40305
ALL RESERVATION RESULTS DELETED?
YES
S40308
INFORM CONTENT SERVER OF COMPLETION OF POLICY RESERVATION CANCELLATION
S40309
DELETE POLICIES CORRESPONDING TO ORDERING NO.
NO

FIG.60

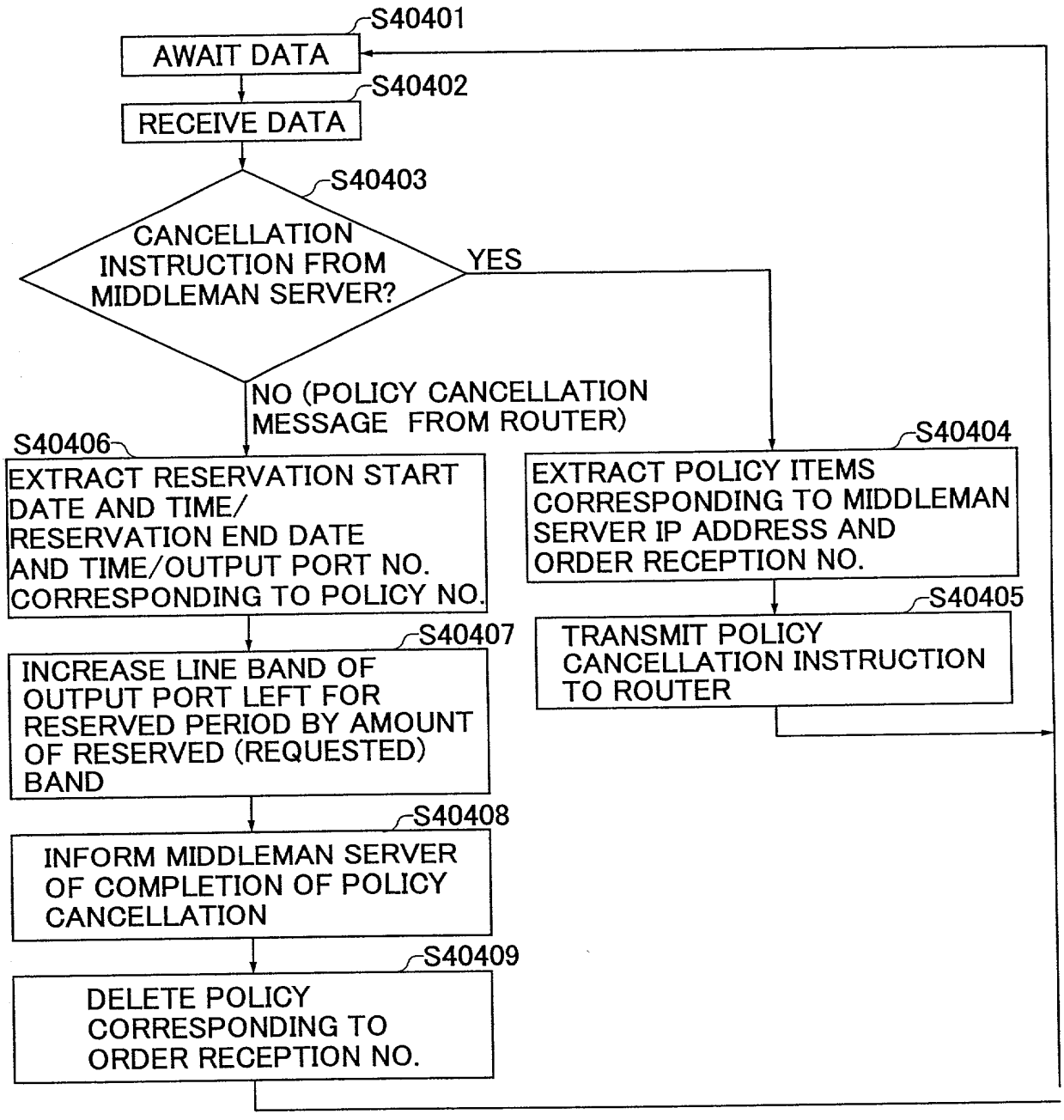

S40401
AWAIT DATA
S40402
RECEIVE DATA
S40403
CANCELLATION INSTRUCTION FROM MIDDLEMAN SERVER?
YES
NO (POLICY CANCELLATION MESSAGE FROM ROUTER)
S40406
EXTRACT RESERVATION START DATE AND TIME/ RESERVATION END DATE AND TIME/OUTPUT PORT NO. CORRESPONDING TO POLICY NO.
S40407
INCREASE LINE BAND OF OUTPUT PORT LEFT FOR RESERVED PERIOD BY AMOUNT OF RESERVED (REQUESTED) BAND
S40408
INFORM MIDDLEMAN SERVER OF COMPLETION OF POLICY CANCELLATION
S40409
DELETE POLICY CORRESPONDING TO ORDER RECEPTION NO.
S40404
EXTRACT POLICY ITEMS CORRESPONDING TO MIDDLEMAN SERVER IP ADDRESS AND ORDER RECEPTION NO.
S40405
TRANSMIT POLICY CANCELLATION INSTRUCTION TO ROUTER

FIG.61

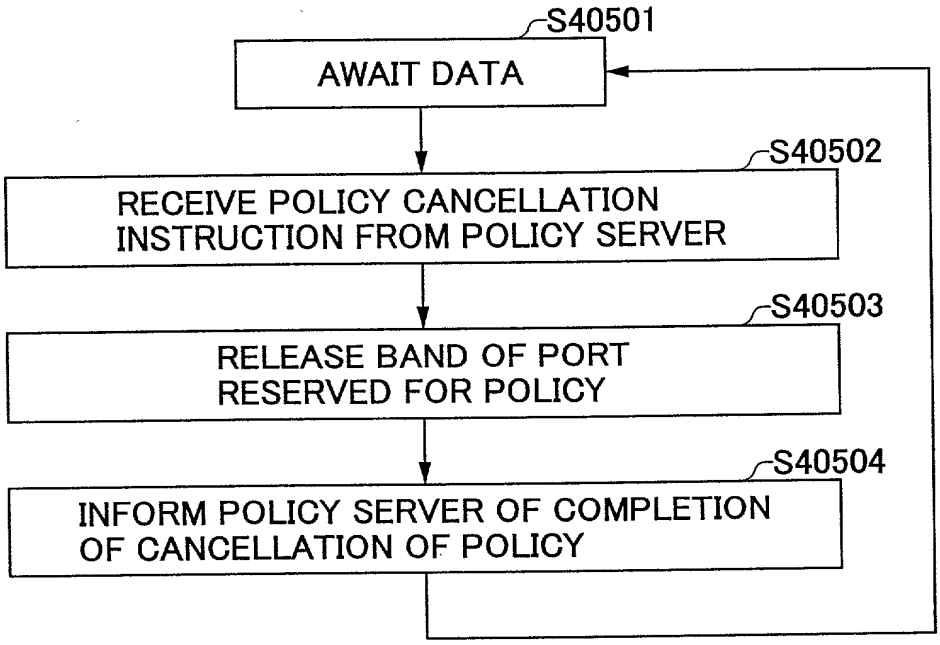

S40501
AWAIT DATA
S40502
RECEIVE POLICY CANCELLATION INSTRUCTION FROM POLICY SERVER
S40503
RELEASE BAND OF PORT RESERVED FOR POLICY
S40504
INFORM POLICY SERVER OF COMPLETION OF CANCELLATION OF POLICY

FIG.62A

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Ra	P1	—	—	—	—	—	—	—	—	—	—	—	—	—
Ra	P2	—	—	—	—	—	—	—	—	—	—	—	—	—

FIG.62B

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Rb	P5	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.308M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M
Rb	P6	—	—	—	—	—	—	—	—	—	—	—	—	—

FIG.62C

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Rc	P10	1M	1M	1M	1M	1M	1M	0.936M	1M	1M	1M	1M	1M	1M
Rc	P11	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Rd	P14	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M
Rd	P16	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M

FIG.63A

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.20.0.2	132.30.0.2	128K	2001/9/1 10:00	2001/9/1 12:00			130.10.0.5	P2
2	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β 3	130.10.0.5	P1

FIG.63B

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	132.30.0.2	130.20.0.2	128K	2001/9/1 10:00	2001/9/1 12:00			132.10.0.5	P6
2	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β 2	132.10.0.5	P5

FIG.63C

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β 1	134.10.0.5	P10

FIG.64A

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 130.10.0.2	DATA (CANCELLATION OF α1 POLICY)

FIG.64B

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
α1	138.10.0.1	CONTENT A	130.10.0.2	64K	2000/9/1 10:00	2001/9/1 12:00	134.30.0.1
							132.40.0.1
							130.30.0.1

FIG.64C

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 136.10.0.1	DATA (CANCELLATION OF α1 POLICY)

FIG.65A

CONTENT SERVER IP ADDRESS	ORDERING NO.	ORDER RECEPTION NUMBER	POLICY SERVER IP ADDRESS	RESERVATION RESULT
136.10.0.1	α 1	β 1	134.40.0.3	○
		β 2	132.50.0.3	○
		β 3	130.40.0.3	○

FIG.65B

DESTINATION IP ADDRESS 134.40.0.3	TRANSMITTER IP ADDRESS 138.10.0.1	DATA (INSTRUCTION TO CANCEL β 1 POLICY FOR POLICY SERVER Pc)

DESTINATION IP ADDRESS 132.50.0.3	TRANSMITTER IP ADDRESS 138.10.0.1	DATA (INSTRUCTION TO CANCEL β 2 POLICY FOR POLICY SERVER Pb)

FIG.65D

DESTINATION IP ADDRESS 130.40.0.3	TRANSMITTER IP ADDRESS 138.10.0.1	DATA (INSTRUCTION TO CANCEL β 3 POLICY FOR POLICY SERVER Pa)

FIG.66A

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β1	134.10.0.5	P10

FIG.66B

DESTINATION IP ADDRESS 134.10.0.5	TRANSMITTER IP ADDRESS 134.40.0.3	DATA (INSTRUCTION TO CANCEL NO.1 POLICY)

FIG.66C

DESTINATION IP ADDRESS 134.40.0.3	TRANSMITTER IP ADDRESS 134.10.0.5	DATA (COMPLETION OF NO.1 POLICY CANCELLATION)

FIG.67A

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
1	130.10.0.2	136.10.0.1	64K	2001/9/1 10:00	2001/9/1 12:00	138.10.0.1	β1	134.10.0.5	P10

FIG.67B

RESIDUAL LINE BAND=0.936Mbps+64Kbps
=1Mbps

FIG.67C

ROUTER	PORT NO.	LINE BAND FOR USE (bps)	LINE BAND LEFT FOR EACH RESERVATION PERIOD (bps)											
			0-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Rc	P10	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Rc	P11	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
Rd	P14	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M	1.5M
Rd	P16	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M

FIG.67D

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 134.40.0.3	DATA (COMPLETION OF β 1 POLICY RESERVATION CANCELLATION)

FIG.67E

POLICY NO.	DESTINATION IP ADDRESS	TRANSMITTER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	MIDDLEMAN SERVER IP ADDRESS	ORDER RECEPTION NO.	ROUTER VIRTUAL IP ADDRESS	OUTPUT PORT NO.
~~1~~	~~138.10.0.2~~	~~136.10.0.1~~	~~64K~~	~~2001/9/1~~ 10:00	~~2001/9/1~~ 12:00	~~138.10.0.1~~	~~β 1~~	~~134.10.0.5~~	~~P10~~

FIG.68A

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 132.50.0.3	DATA (COMPLETION OF β2 POLICY RESERVATION CANCELLATION)

FIG.68B

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 130.40.0.3	DATA (COMPLETION OF β3 POLICY RESERVATION CANCELLATION)

FIG.68C

ORDERING NO.	CONTENT SERVER IP ADDRESS	ORDER RECEPTION NUMBER	POLICY SERVER IP ADDRESS	RESERVATION RESULT
α1	136.10.0.1	β1	134.40.0.3	
		β2	132.50.0.3	
		β3	130.40.0.3	

FIG.68D

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 138.10.0.1	DATA (COMPLETION OF α1 POLICY RESERVATION CANCELLATION)

FIG.68E

ORDERING NO.	CONTENT SERVER IP ADDRESS	ORDER RECEPTION NUMBER	POLICY SERVER IP ADDRESS	RESERVATION RESULT
~~α1~~	~~136.10.0.1~~	~~β1~~	~~134.40.0.3~~	
		~~β2~~	~~132.50.0.3~~	
		~~β3~~	~~130.40.0.3~~	

FIG.69A

DESTINATION IP ADDRESS 130.10.0.2	TRANSMITTER IP ADDRESS 136.10.0.1	DATA (COMPLETION OF α1 POLICY CANCELLATION)

FIG.69B

ORDERING NO.	MIDDLEMAN SERVER IP ADDRESS	CONTENT NAME	USER IP ADDRESS	REQUESTED BAND (bps)	RESERVATION START DATE AND TIME	RESERVATION END DATE AND TIME	ROUTER PORT IP ADDRESS (TRACE ROUTE INPUT SIDE)
~~α1~~	~~138.10.0.1~~	~~CONTENT A~~	~~130.10.0.2~~	~~64K~~			~~134.30.0.1~~
							~~132.40.0.1~~
							~~130.30.0.1~~

FIG.70A

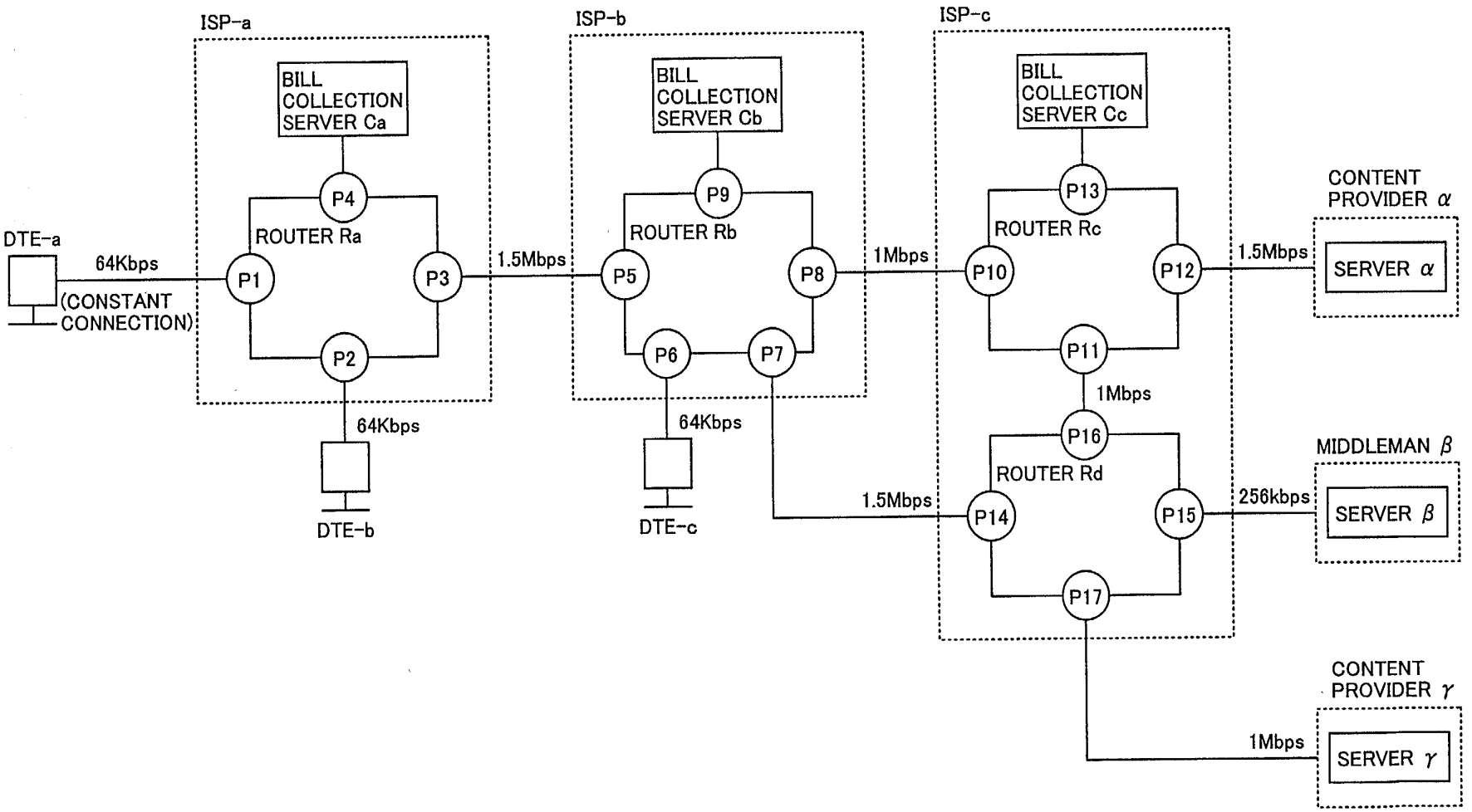

ISP-a
ISP-b
ISP-c
BILL COLLECTION SERVER Ca
BILL COLLECTION SERVER Cb
BILL COLLECTION SERVER Cc
P4
P9
P13
ROUTER Ra
ROUTER Rb
ROUTER Rc
DTE-a
64Kbps
(CONSTANT CONNECTION)
P1
P3
1.5Mbps
P5
P8
1Mbps
P10
P12
1.5Mbps
CONTENT PROVIDER α
SERVER α
P2
P6
P7
P11
1Mbps
64Kbps
64Kbps
P16
MIDDLEMAN β
ROUTER Rd
DTE-b
DTE-c
1.5Mbps
P14
P15
256kbps
SERVER β
P17
CONTENT PROVIDER γ
1Mbps
SERVER γ

FIG.70B

TERMINAL/ SERVER	IP ADDRESS	ISP-a	PORT	IP ADDRESS	ISP-b	PORT	IP ADDRESS	ISP-c	PORT	IP ADDRESS
DTE-a	130.10.0.2	ROUTER Ra	P1	130.10.0.1	ROUTER Rb	P5	132.10.0.1	ROUTER Rc	P10	134.10.0.1
DTE-b	130.20.0.2		P2	130.20.0.1		P6	132.20.0.1		P11	134.20.0.1
DTE-c	132.20.0.2		P3	130.30.0.1		P7	132.30.0.1		P12	134.30.0.1
SERVER α	136.10.0.1		P4	130.40.0.1		P8	132.40.0.1		P13	134.40.0.1
SERVER β	138.10.0.1	SERVER Ca	-	130.40.0.2		P9	132.50.0.1	ROUTER Rd	P14	134.50.0.1
SERVER γ	140.10.0.1				SERVER Cb	-	132.50.0.2		P15	134.60.0.1
									P16	134.20.0.2
									P17	134.70.0.2
								SERVER Cc	-	134.40.0.2

FIG.71

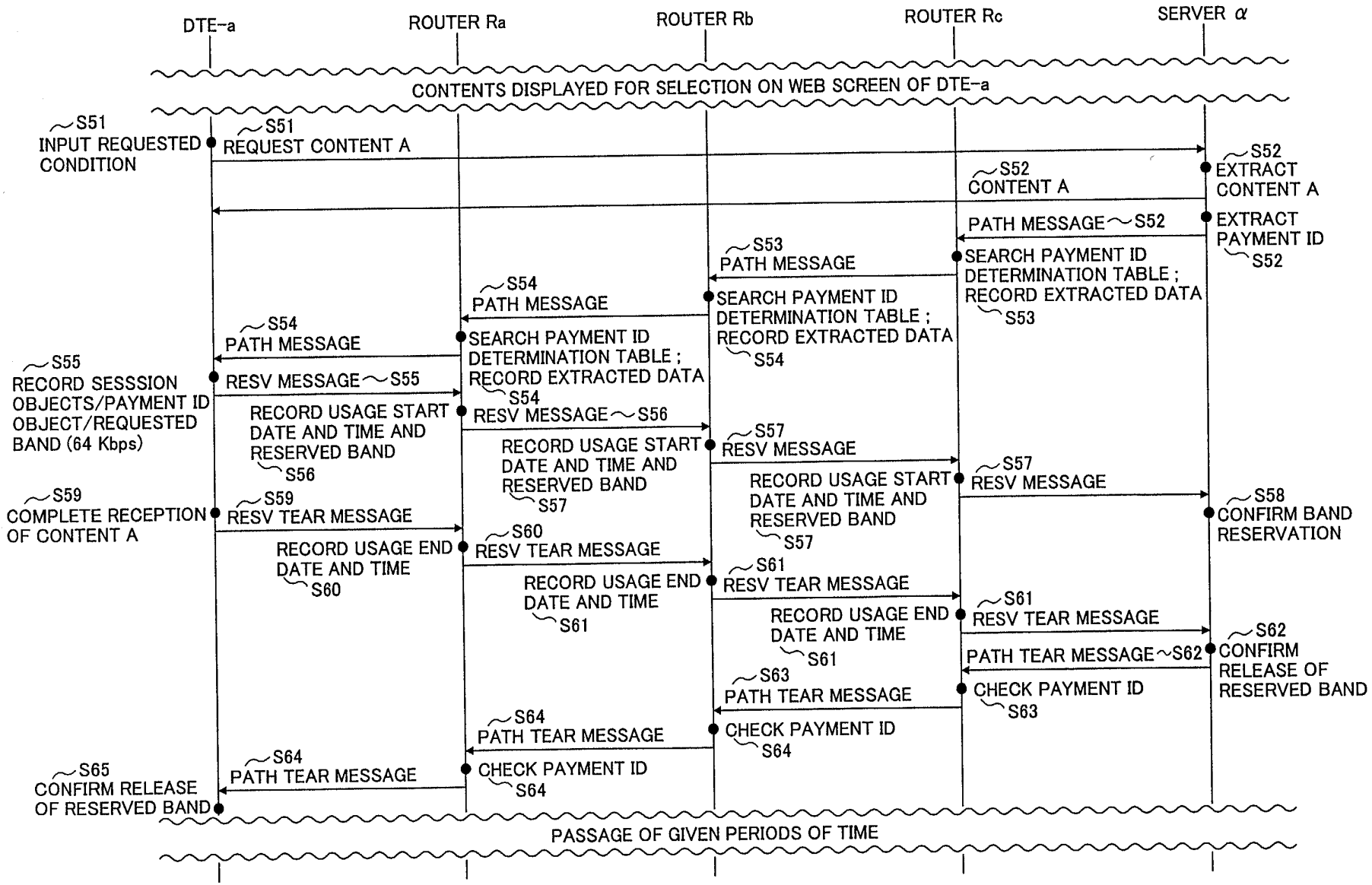

DTE-a
ROUTER Ra
ROUTER Rb
ROUTER Rc
SERVER α
CONTENTS DISPLAYED FOR SELECTION ON WEB SCREEN OF DTE-a
S51
INPUT REQUESTED CONDITION
S51
REQUEST CONTENT A
S52
EXTRACT CONTENT A
S52
CONTENT A
S52
EXTRACT PAYMENT ID
PATH MESSAGE S52
S53
PATH MESSAGE
SEARCH PAYMENT ID DETERMINATION TABLE ; RECORD EXTRACTED DATA
S53
S54
PATH MESSAGE
SEARCH PAYMENT ID DETERMINATION TABLE ; RECORD EXTRACTED DATA
S54
S54
PATH MESSAGE
SEARCH PAYMENT ID DETERMINATION TABLE ; RECORD EXTRACTED DATA
S54
S55
RECORD SESSSION OBJECTS/PAYMENT ID OBJECT/REQUESTED BAND (64 Kbps)
RESV MESSAGE S55
RECORD USAGE START DATE AND TIME AND RESERVED BAND
S56
RESV MESSAGE S56
S57
RESV MESSAGE
RECORD USAGE START DATE AND TIME AND RESERVED BAND
S57
S57
RESV MESSAGE
RECORD USAGE START DATE AND TIME AND RESERVED BAND
S57
S58
CONFIRM BAND RESERVATION
S59
COMPLETE RECEPTION OF CONTENT A
S59
RESV TEAR MESSAGE
RECORD USAGE END DATE AND TIME
S60
S60
RESV TEAR MESSAGE
RECORD USAGE END DATE AND TIME
S61
S61
RESV TEAR MESSAGE
RECORD USAGE END DATE AND TIME
S61
S61
RESV TEAR MESSAGE
S62
CONFIRM RELEASE OF RESERVED BAND
PATH TEAR MESSAGE S62
S63
PATH TEAR MESSAGE
CHECK PAYMENT ID
S63
S64
PATH TEAR MESSAGE
CHECK PAYMENT ID
S64
S64
PATH TEAR MESSAGE
CHECK PAYMENT ID
S64
S65
CONFIRM RELEASE OF RESERVED BAND
PASSAGE OF GIVEN PERIODS OF TIME

FIG.72

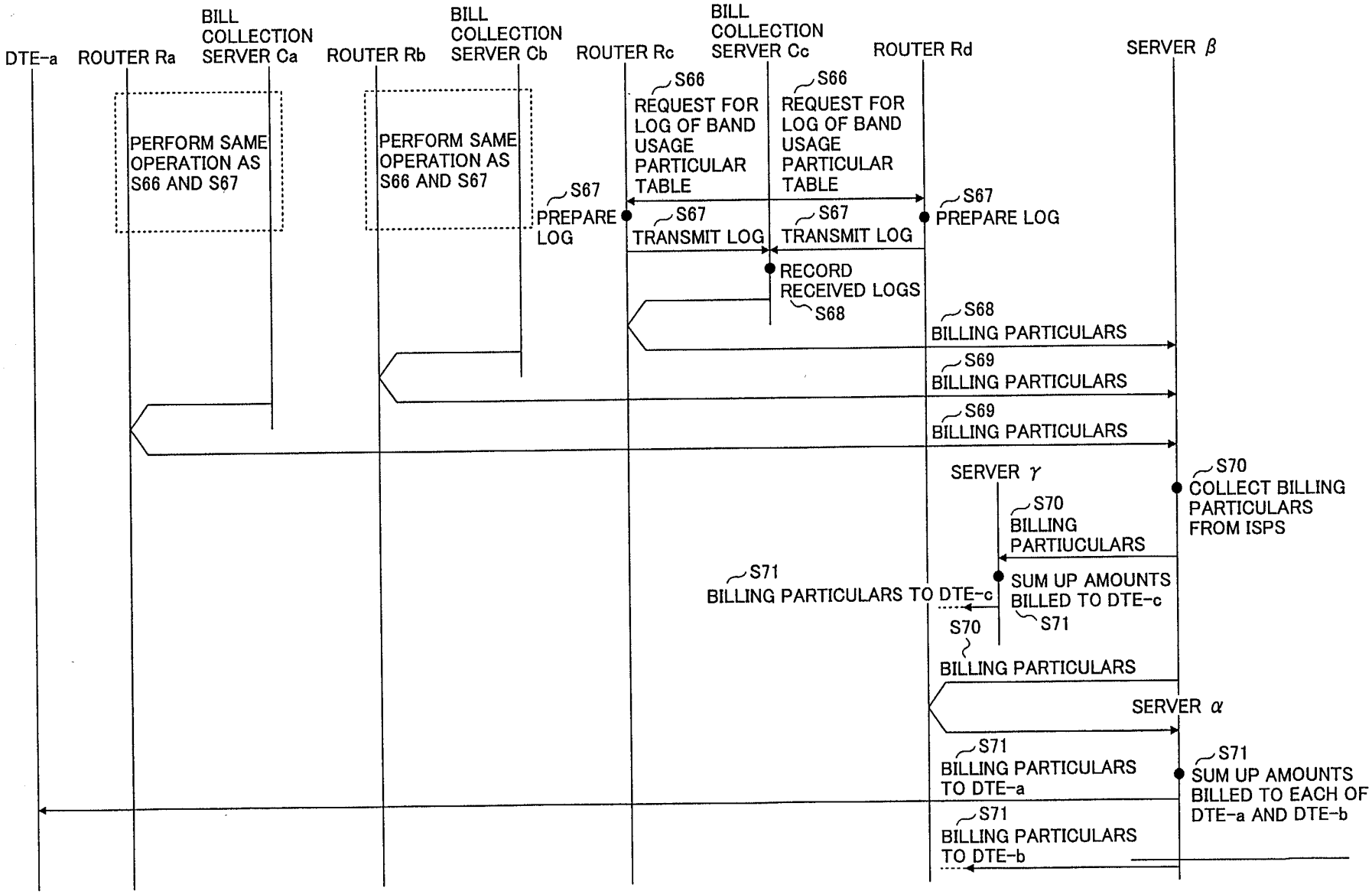

DTE-a
ROUTER Ra
BILL COLLECTION SERVER Ca
ROUTER Rb
BILL COLLECTION SERVER Cb
ROUTER Rc
BILL COLLECTION SERVER Cc
ROUTER Rd
SERVER β
PERFORM SAME OPERATION AS S66 AND S67
PERFORM SAME OPERATION AS S66 AND S67
S66
REQUEST FOR LOG OF BAND USAGE PARTICULAR TABLE
S66
REQUEST FOR LOG OF BAND USAGE PARTICULAR TABLE
S67
PREPARE LOG
S67
TRANSMIT LOG
S67
TRANSMIT LOG
S67
PREPARE LOG
RECORD RECEIVED LOGS
S68
S68
BILLING PARTICULARS
S69
BILLING PARTICULARS
S69
BILLING PARTICULARS
SERVER γ
S70
COLLECT BILLING PARTICULARS FROM ISPS
S70
BILLING PARTIUCULARS
S71
BILLING PARTICULARS TO DTE-c
SUM UP AMOUNTS BILLED TO DTE-c
S71
S70
BILLING PARTICULARS
SERVER α
S71
BILLING PARTICULARS TO DTE-a
S71
SUM UP AMOUNTS BILLED TO EACH OF DTE-a AND DTE-b
S71
BILLING PARTICULARS TO DTE-b

FIG.73

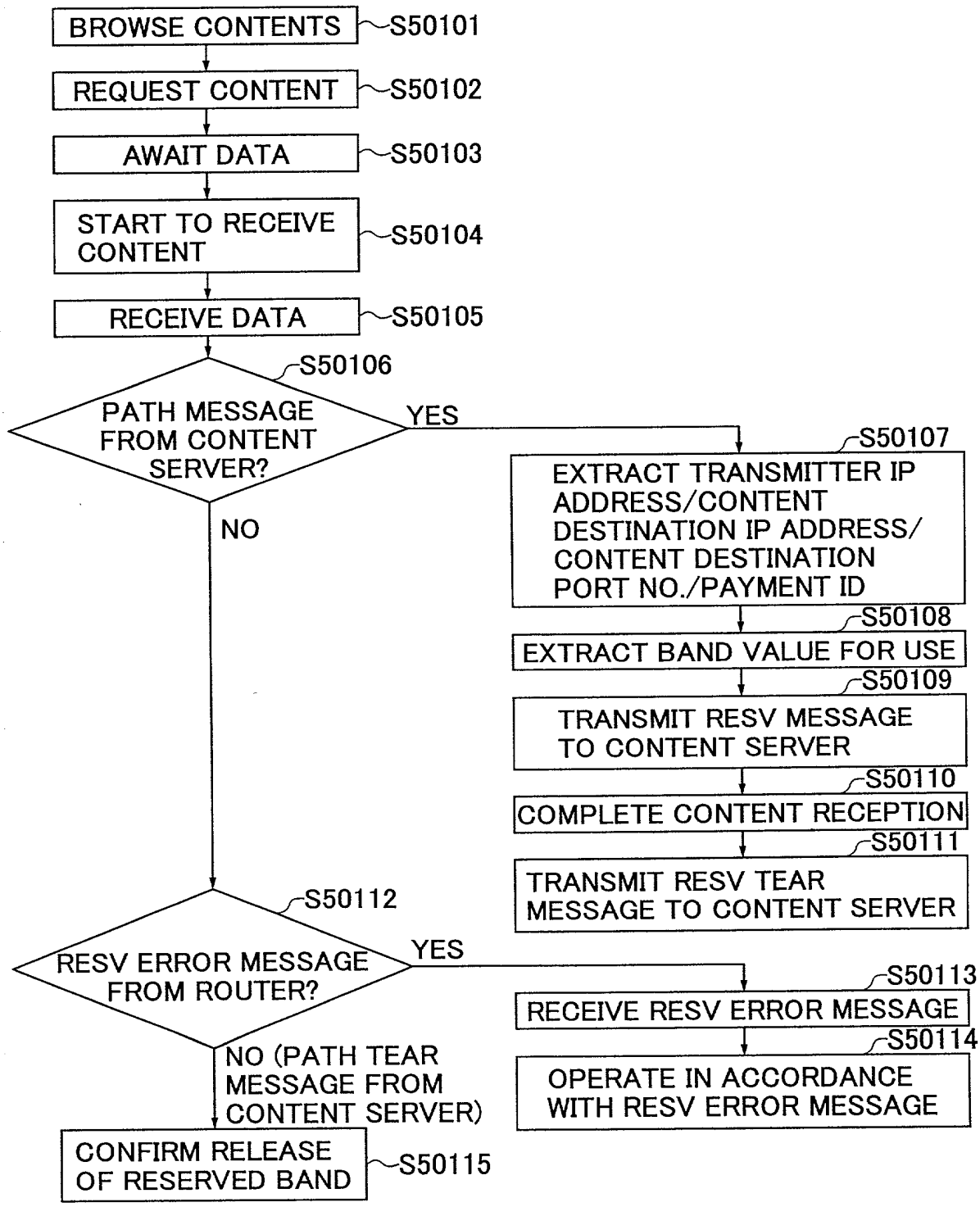

BROWSE CONTENTS
S50101
REQUEST CONTENT
S50102
AWAIT DATA
S50103
START TO RECEIVE CONTENT
S50104
RECEIVE DATA
S50105
S50106
PATH MESSAGE FROM CONTENT SERVER?
YES
NO
S50107
EXTRACT TRANSMITTER IP ADDRESS/CONTENT DESTINATION IP ADDRESS/ CONTENT DESTINATION PORT NO./PAYMENT ID
S50108
EXTRACT BAND VALUE FOR USE
S50109
TRANSMIT RESV MESSAGE TO CONTENT SERVER
S50110
COMPLETE CONTENT RECEPTION
S50111
TRANSMIT RESV TEAR MESSAGE TO CONTENT SERVER
S50112
RESV ERROR MESSAGE FROM ROUTER?
YES
NO (PATH TEAR MESSAGE FROM CONTENT SERVER)
S50113
RECEIVE RESV ERROR MESSAGE
S50114
OPERATE IN ACCORDANCE WITH RESV ERROR MESSAGE
CONFIRM RELEASE OF RESERVED BAND
S50115

FIG.74

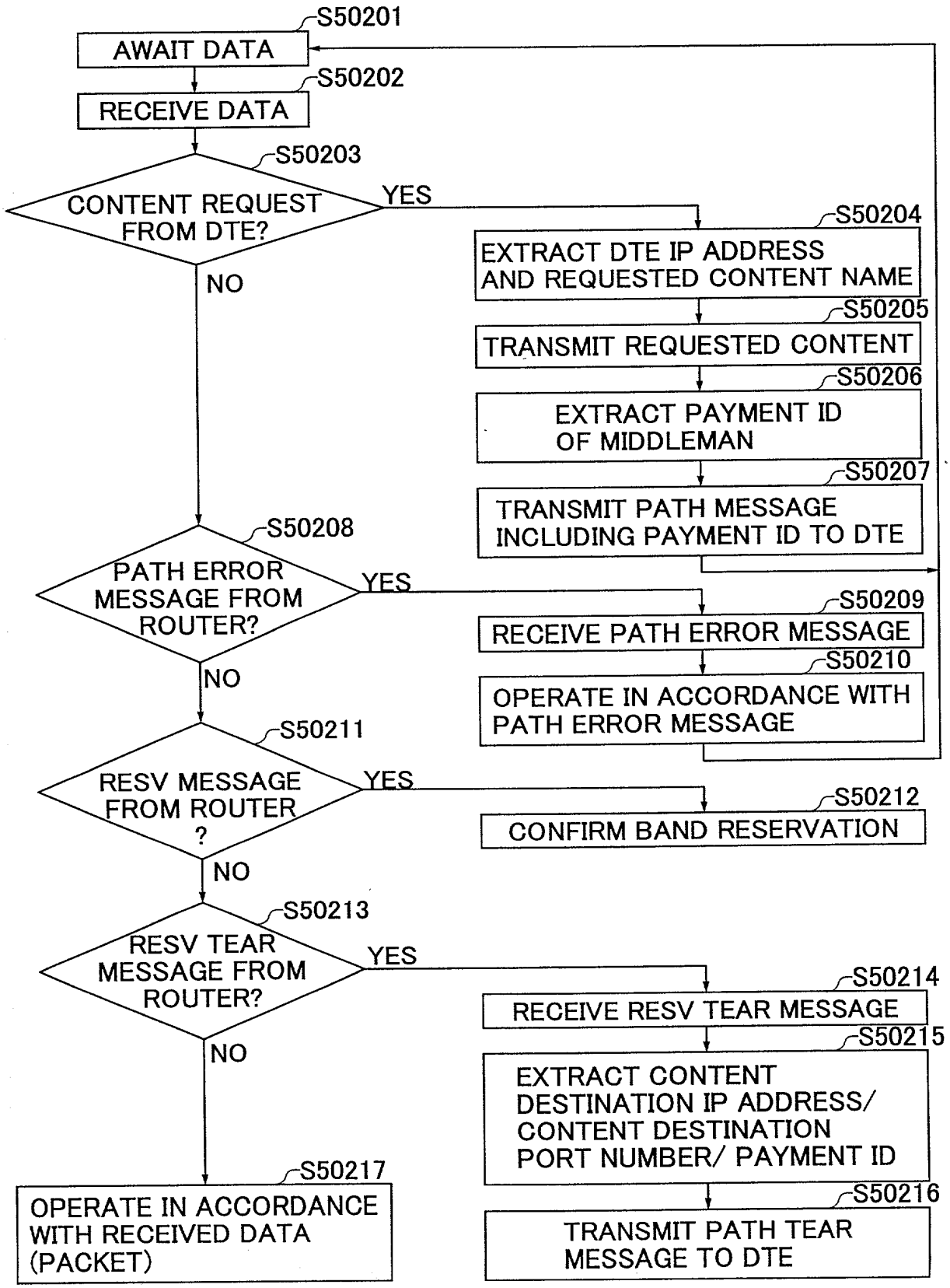

S50201
AWAIT DATA
S50202
RECEIVE DATA
S50203
CONTENT REQUEST FROM DTE?
YES
NO
S50204
EXTRACT DTE IP ADDRESS AND REQUESTED CONTENT NAME
S50205
TRANSMIT REQUESTED CONTENT
S50206
EXTRACT PAYMENT ID OF MIDDLEMAN
S50207
TRANSMIT PATH MESSAGE INCLUDING PAYMENT ID TO DTE
S50208
PATH ERROR MESSAGE FROM ROUTER?
YES
NO
S50209
RECEIVE PATH ERROR MESSAGE
S50210
OPERATE IN ACCORDANCE WITH PATH ERROR MESSAGE
S50211
RESV MESSAGE FROM ROUTER ?
YES
NO
S50212
CONFIRM BAND RESERVATION
S50213
RESV TEAR MESSAGE FROM ROUTER?
YES
NO
S50214
RECEIVE RESV TEAR MESSAGE
S50215
EXTRACT CONTENT DESTINATION IP ADDRESS/ CONTENT DESTINATION PORT NUMBER/ PAYMENT ID
S50216
TRANSMIT PATH TEAR MESSAGE TO DTE
S50217
OPERATE IN ACCORDANCE WITH RECEIVED DATA (PACKET)

FIG.75

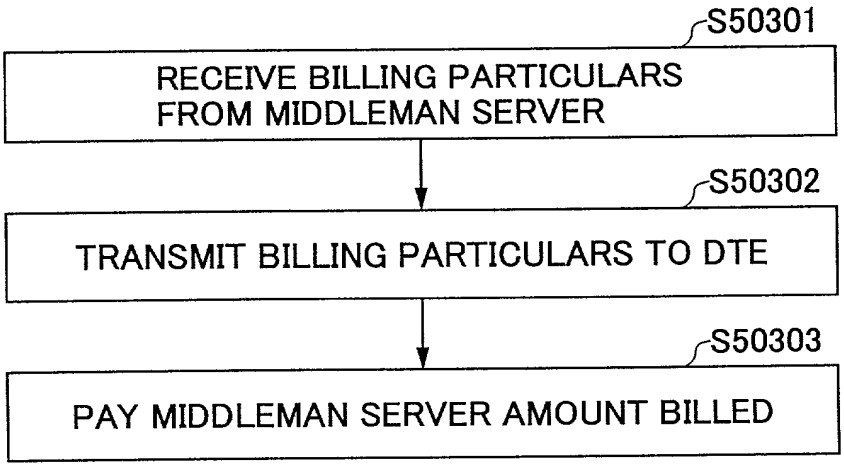

S50301
RECEIVE BILLING PARTICULARS FROM MIDDLEMAN SERVER
S50302
TRANSMIT BILLING PARTICULARS TO DTE
S50303
PAY MIDDLEMAN SERVER AMOUNT BILLED

FIG.76

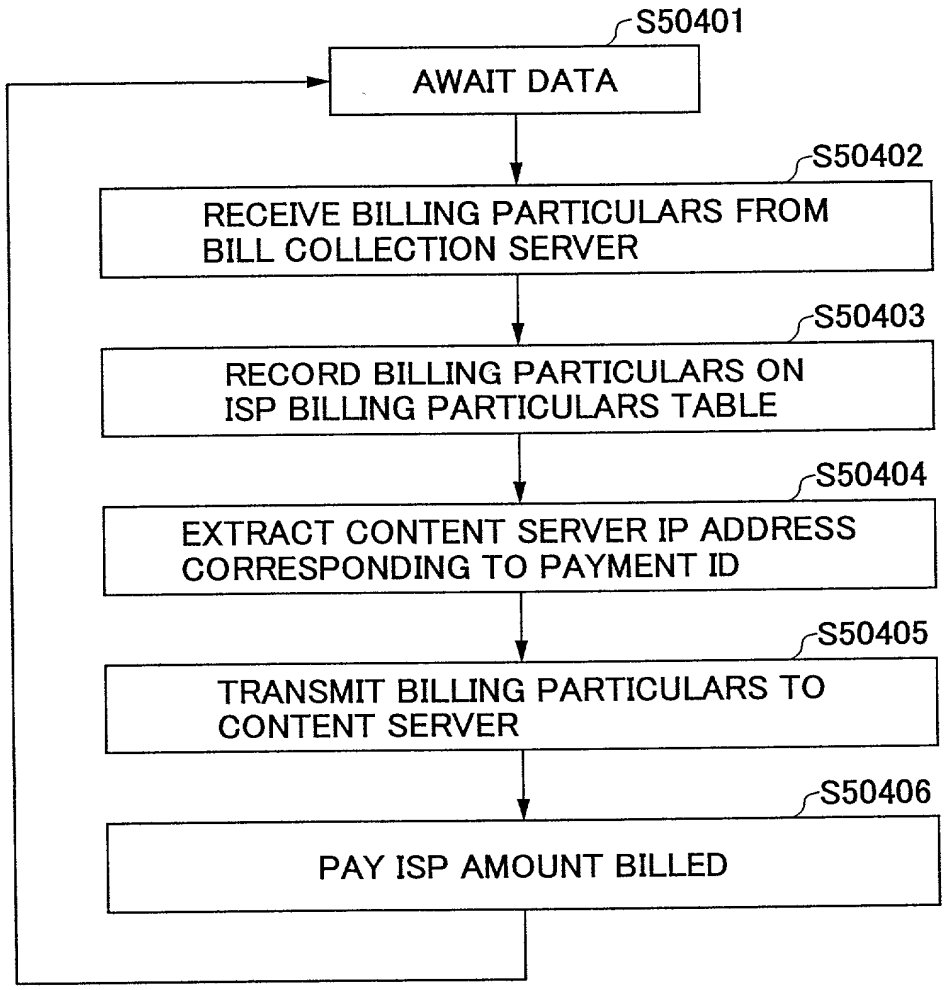

S50401
AWAIT DATA
S50402
RECEIVE BILLING PARTICULARS FROM BILL COLLECTION SERVER
S50403
RECORD BILLING PARTICULARS ON ISP BILLING PARTICULARS TABLE
S50404
EXTRACT CONTENT SERVER IP ADDRESS CORRESPONDING TO PAYMENT ID
S50405
TRANSMIT BILLING PARTICULARS TO CONTENT SERVER
S50406
PAY ISP AMOUNT BILLED

FIG.77

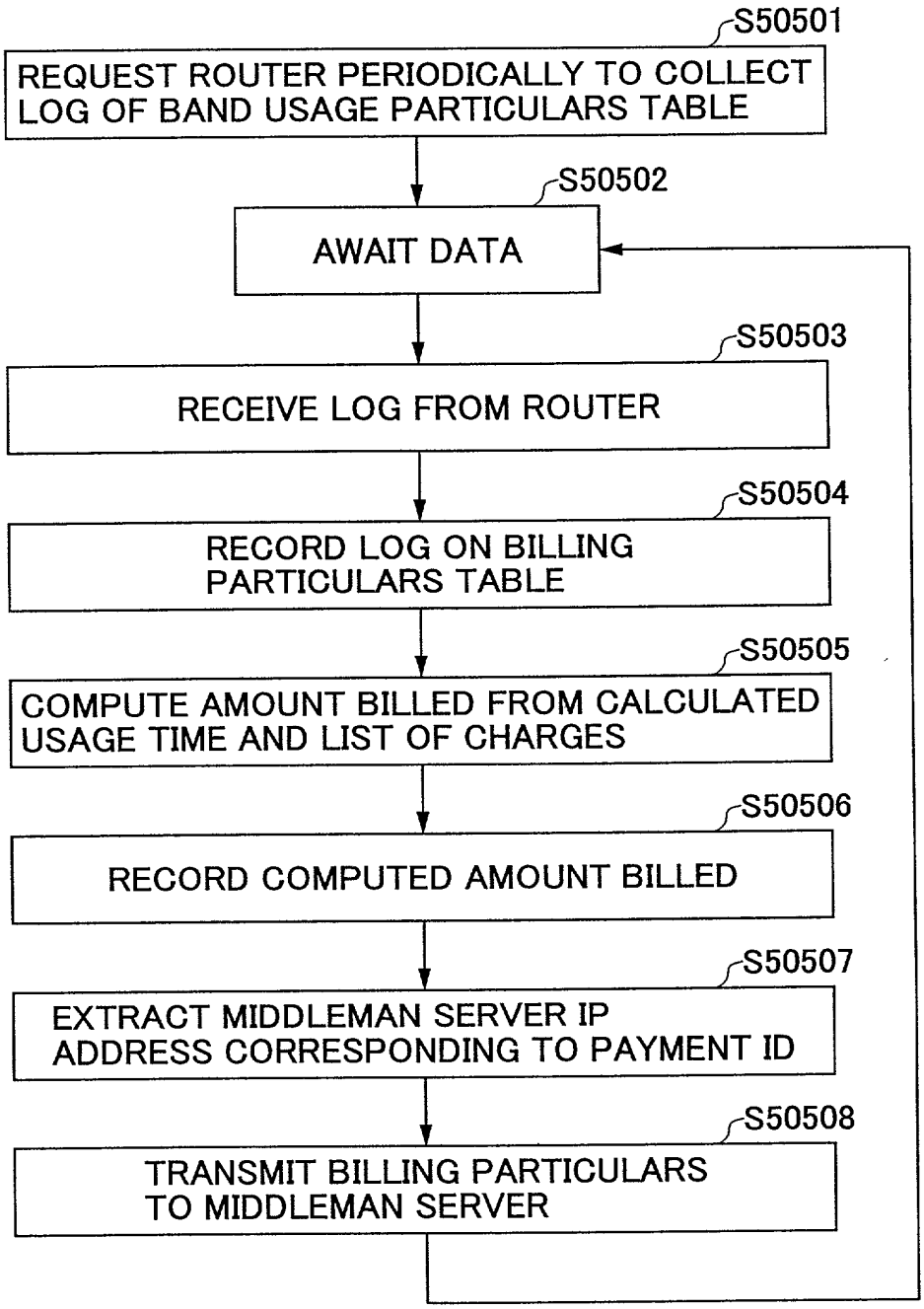

S50501
REQUEST ROUTER PERIODICALLY TO COLLECT LOG OF BAND USAGE PARTICULARS TABLE
S50502
AWAIT DATA
S50503
RECEIVE LOG FROM ROUTER
S50504
RECORD LOG ON BILLING PARTICULARS TABLE
S50505
COMPUTE AMOUNT BILLED FROM CALCULATED USAGE TIME AND LIST OF CHARGES
S50506
RECORD COMPUTED AMOUNT BILLED
S50507
EXTRACT MIDDLEMAN SERVER IP ADDRESS CORRESPONDING TO PAYMENT ID
S50508
TRANSMIT BILLING PARTICULARS TO MIDDLEMAN SERVER

FIG.78

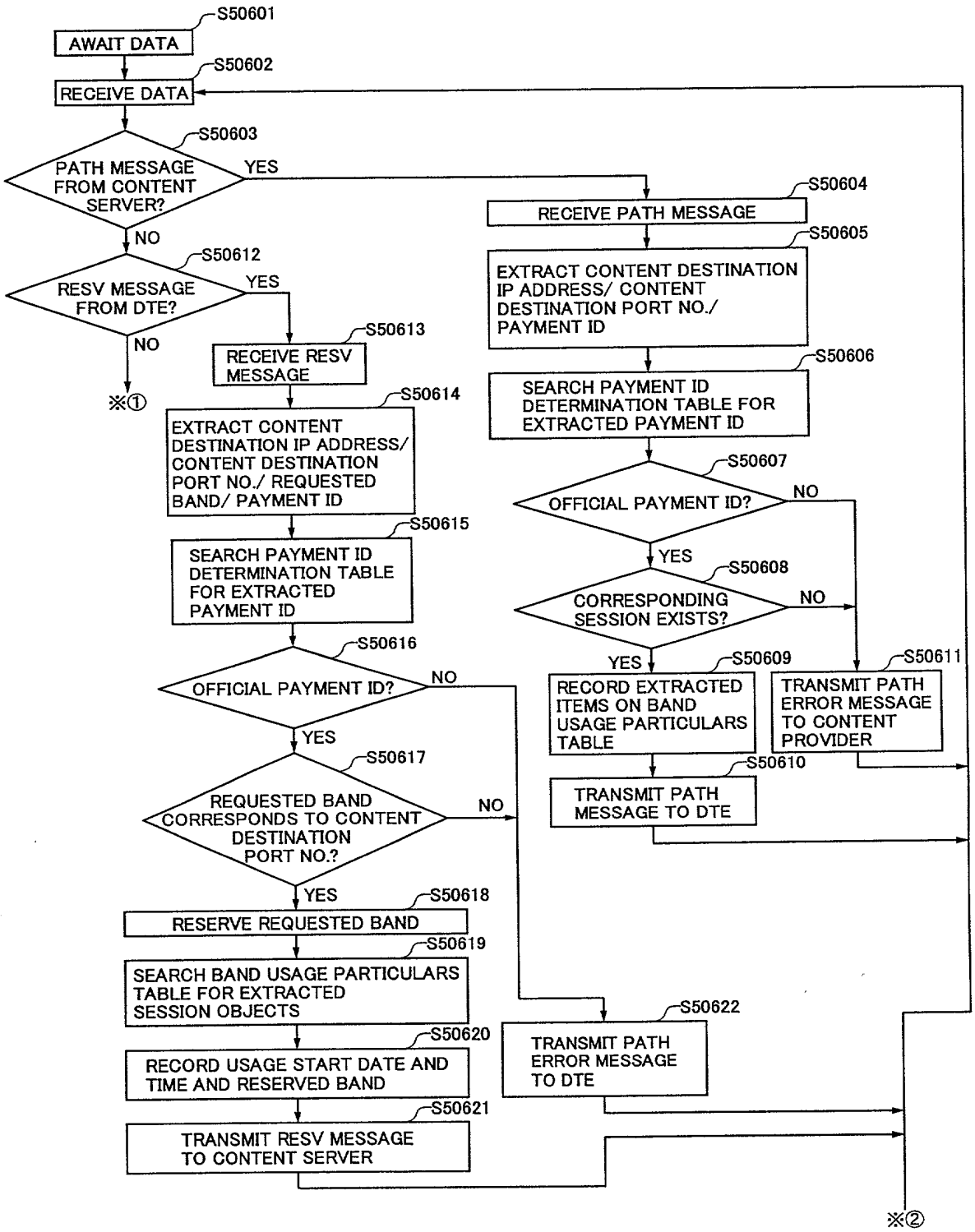
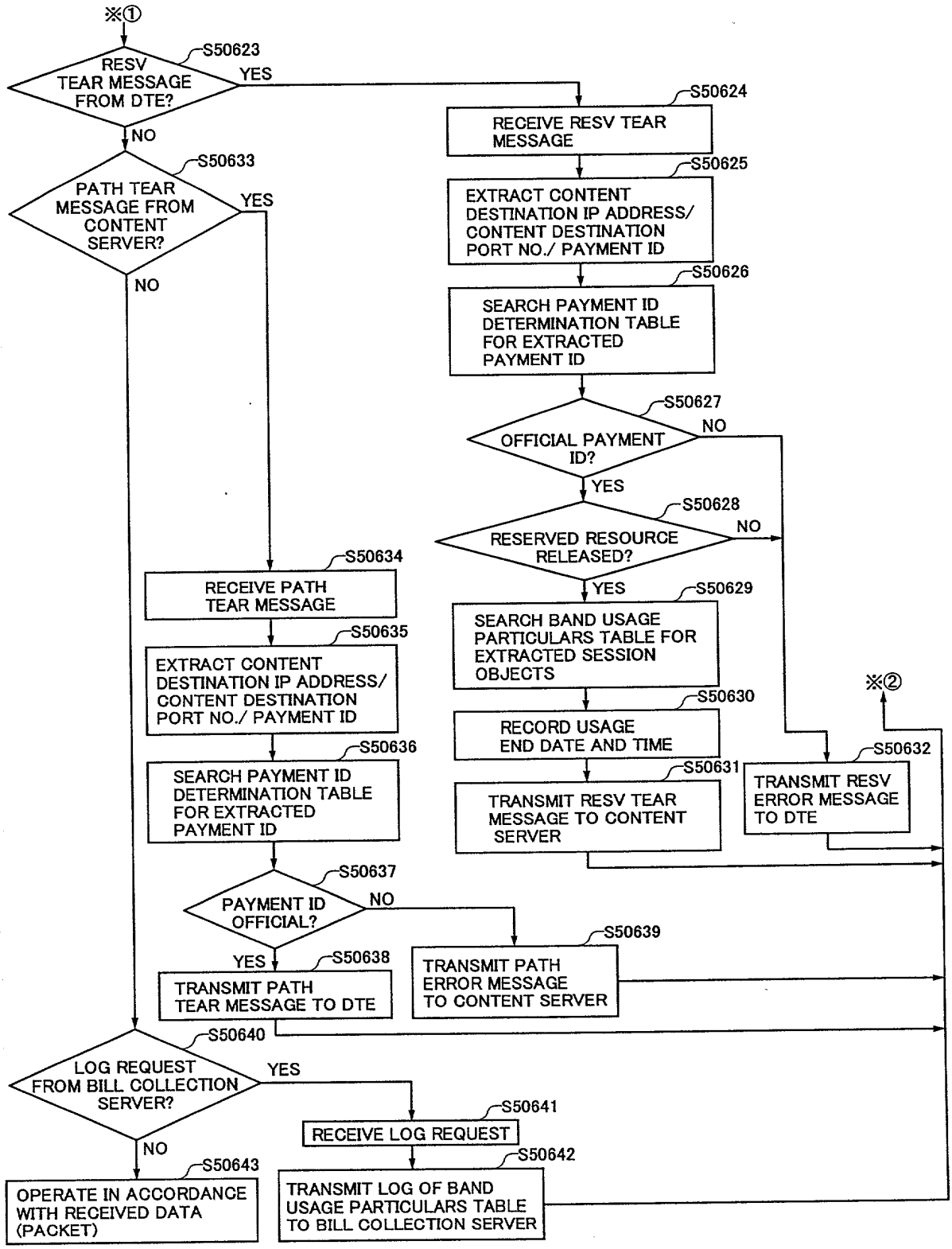

S50601
AWAIT DATA
S50602
RECEIVE DATA
S50603
PATH MESSAGE FROM CONTENT SERVER?
YES
NO
S50604
RECEIVE PATH MESSAGE
S50605
EXTRACT CONTENT DESTINATION IP ADDRESS/ CONTENT DESTINATION PORT NO./ PAYMENT ID
S50606
SEARCH PAYMENT ID DETERMINATION TABLE FOR EXTRACTED PAYMENT ID
S50607
OFFICIAL PAYMENT ID?
NO
YES
S50608
CORRESPONDING SESSION EXISTS?
NO
YES
S50609
RECORD EXTRACTED ITEMS ON BAND USAGE PARTICULARS TABLE
S50610
TRANSMIT PATH MESSAGE TO DTE
S50611
TRANSMIT PATH ERROR MESSAGE TO CONTENT PROVIDER
S50612
RESV MESSAGE FROM DTE?
YES
NO
※①
S50613
RECEIVE RESV MESSAGE
S50614
EXTRACT CONTENT DESTINATION IP ADDRESS/ CONTENT DESTINATION PORT NO./ REQUESTED BAND/ PAYMENT ID
S50615
SEARCH PAYMENT ID DETERMINATION TABLE FOR EXTRACTED PAYMENT ID
S50616
OFFICIAL PAYMENT ID?
NO
YES
S50617
REQUESTED BAND CORRESPONDS TO CONTENT DESTINATION PORT NO.?
NO
YES
S50618
RESERVE REQUESTED BAND
S50619
SEARCH BAND USAGE PARTICULARS TABLE FOR EXTRACTED SESSION OBJECTS
S50620
RECORD USAGE START DATE AND TIME AND RESERVED BAND
S50621
TRANSMIT RESV MESSAGE TO CONTENT SERVER
S50622
TRANSMIT PATH ERROR MESSAGE TO DTE
※②

FIG.79


※①
S50623
RESV TEAR MESSAGE FROM DTE?
YES
NO
S50624
RECEIVE RESV TEAR MESSAGE
S50625
EXTRACT CONTENT DESTINATION IP ADDRESS/ CONTENT DESTINATION PORT NO./ PAYMENT ID
S50626
SEARCH PAYMENT ID DETERMINATION TABLE FOR EXTRACTED PAYMENT ID
S50627
OFFICIAL PAYMENT ID?
NO
YES
S50628
RESERVED RESOURCE RELEASED?
NO
YES
S50629
SEARCH BAND USAGE PARTICULARS TABLE FOR EXTRACTED SESSION OBJECTS
S50630
RECORD USAGE END DATE AND TIME
S50631
TRANSMIT RESV TEAR MESSAGE TO CONTENT SERVER
S50632
TRANSMIT RESV ERROR MESSAGE TO DTE
※②
S50633
PATH TEAR MESSAGE FROM CONTENT SERVER?
YES
NO
S50634
RECEIVE PATH TEAR MESSAGE
S50635
EXTRACT CONTENT DESTINATION IP ADDRESS/ CONTENT DESTINATION PORT NO./ PAYMENT ID
S50636
SEARCH PAYMENT ID DETERMINATION TABLE FOR EXTRACTED PAYMENT ID
S50637
PAYMENT ID OFFICIAL?
NO
YES
S50638
TRANSMIT PATH TEAR MESSAGE TO DTE
S50639
TRANSMIT PATH ERROR MESSAGE TO CONTENT SERVER
S50640
LOG REQUEST FROM BILL COLLECTION SERVER?
YES
NO
S50641
RECEIVE LOG REQUEST
S50642
TRANSMIT LOG OF BAND USAGE PARTICULARS TABLE TO BILL COLLECTION SERVER
S50643
OPERATE IN ACCORDANCE WITH RECEIVED DATA (PACKET)

PAYMENT ID
β1

FIG.80B

PAYMENT ID
β2

FIG.81A

PAYMENT ID	CONTENT SERVER IP ADDRESS
β1	136.10.0.1
β2	140.10.0.1

FIG.81B

AMOUNT BILLED (YEN)	PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME	ISP SERVER IP ADDRESS

FIG.82A

PAYMENT ID	MIDDLEMAN SERVER IP ADDRESS
β 1	138.10.0.1
β 2	138.10.0.1

FIG.82B

AMOUNT BILLED (YEN)	PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME

FIG.83A

PAYMENT ID
β 1
β 2

FIG.83B

PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
β 1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00

FIG.83C

PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
β 1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00
β 2	132.20.0.2	P6	64K	2001/9/1 9:00	2001/9/1 12:00

FIG.83D

PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
β 1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00

FIG.83E

PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
β 2	132.20.0.2	P6	64K	2001/9/1 9:00	2001/9/1 12:00

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 130.10.0.2	DATA (REQUESTED CONDITION)

FIG.84B

DESTINATION IP ADDRESS 130.10.0.2	TRANSMITTER IP ADDRESS 136.10.0.1	DATA (CONTENT A)

FIG.84C

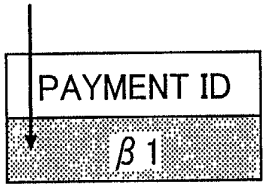


FIG.84D

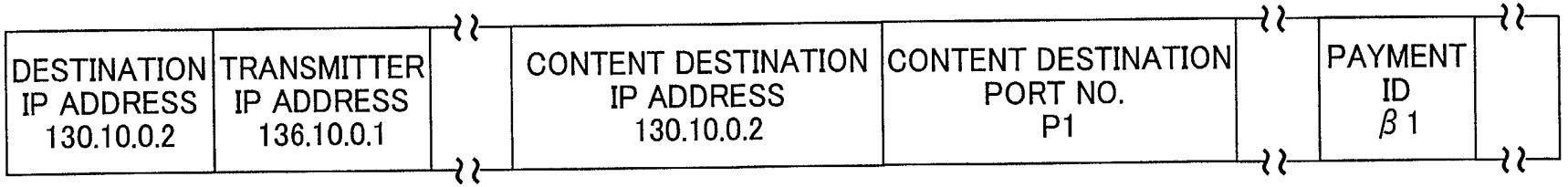


FIG.85A

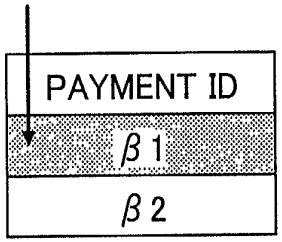


FIG.85B

PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
β1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00
β1	130.10.0.2	P1			

FIG.85C

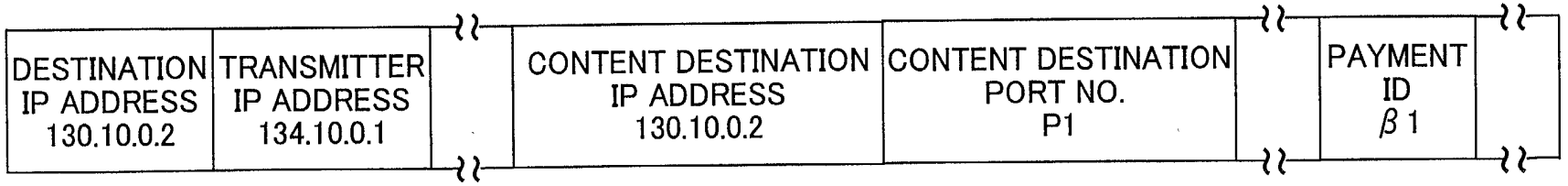


FIG.86A

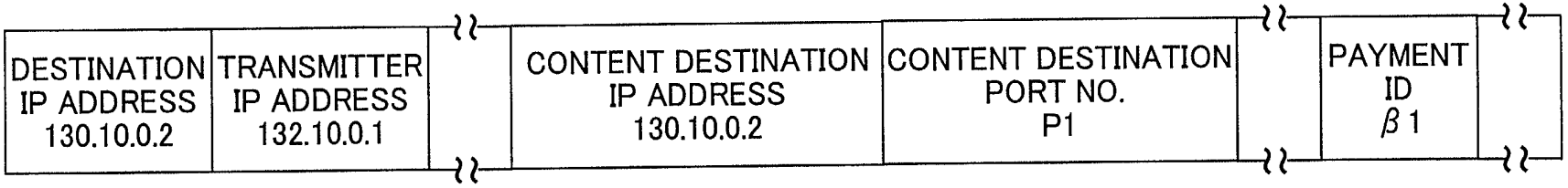


FIG.86B

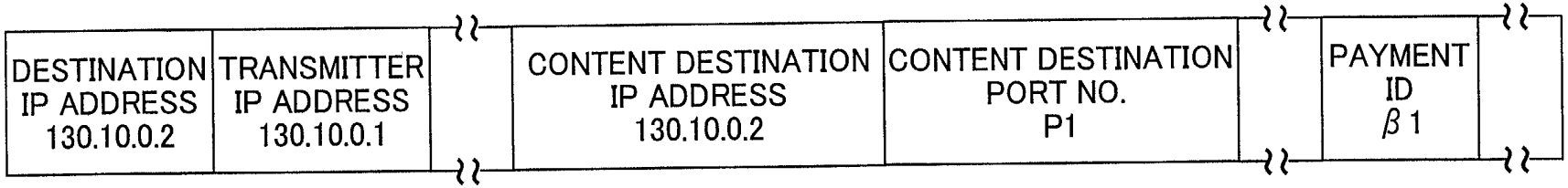


FIG.87

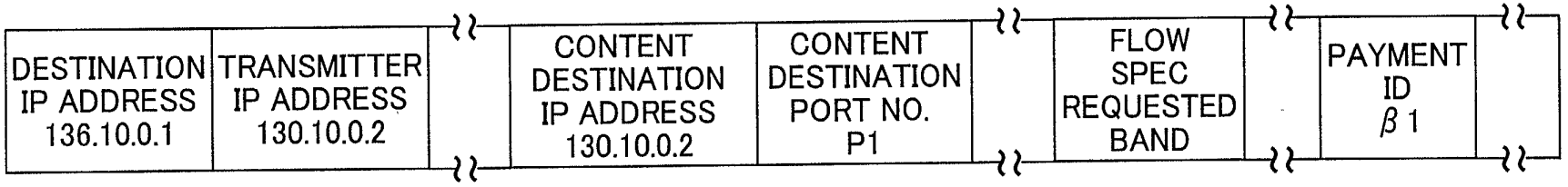

DESTINATION IP ADDRESS 136.10.0.1
TRANSMITTER IP ADDRESS 130.10.0.2
CONTENT DESTINATION IP ADDRESS 130.10.0.2
CONTENT DESTINATION PORT NO. P1
FLOW SPEC REQUESTED BAND
PAYMENT ID β1

FIG.88A

PAYMENT ID
β 1
β 2

FIG.88B

PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
β 1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00
β 1	130.10.0.2	P1	64K	2001/9/1 10:00	

FIG.88C

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 130.30.0.1	CONTENT DESTINATION IP ADDRESS 130.10.0.2	CONTENT DESTINATION PORT NO. P1	FLOW SPEC REQUESTED BAND	PAYMENT ID β 1

FIG.89A

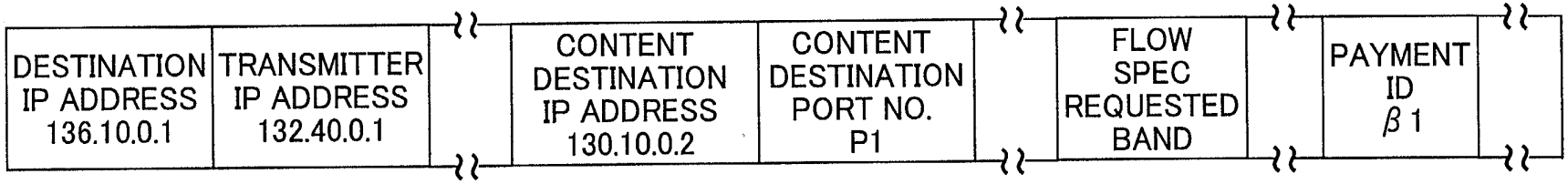


FIG.89B

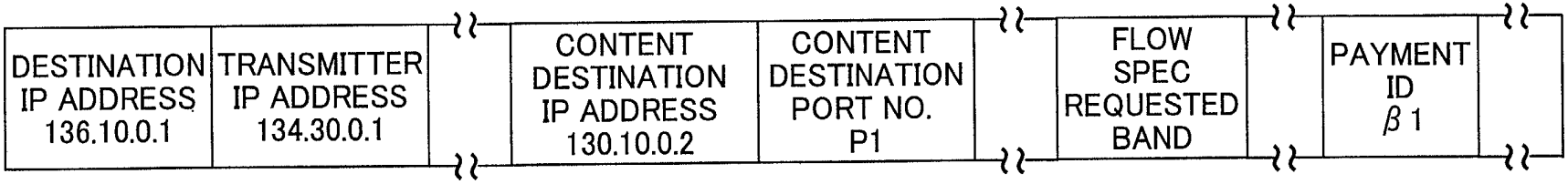


FIG.89C

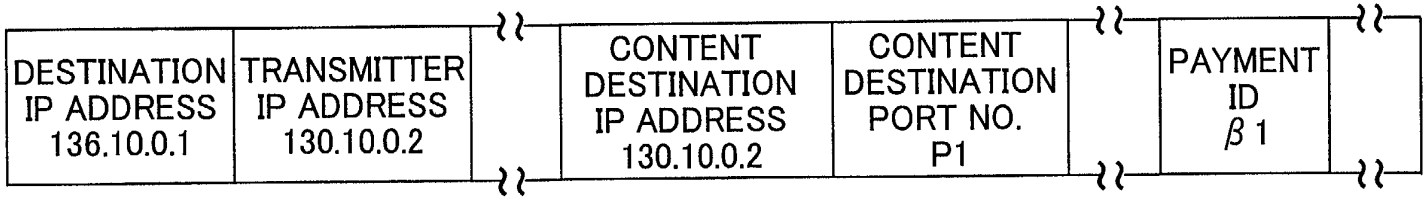


FIG.90A

PAYMENT ID
β1
β2

FIG.90B

PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
β1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00
β1	130.10.0.2	P1	64K	2001/9/1 10:00	2001/9/1 12:00

FIG.90C

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 130.30.0.1	CONTENT DESTINATION IP ADDRESS 130.10.0.2	CONTENT DESTINATION PORT NO. P1	PAYMENT ID β1

FIG.91A

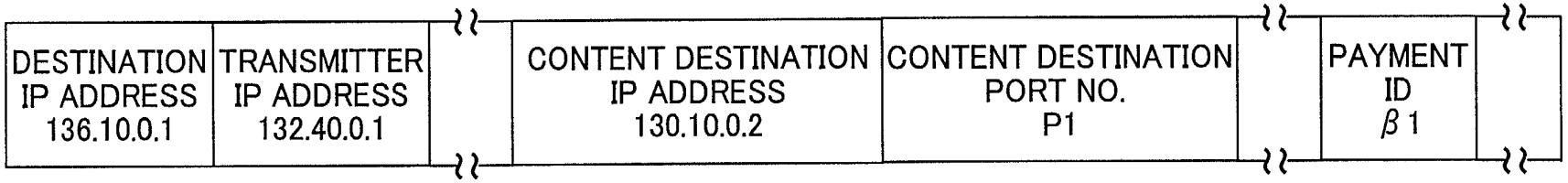


FIG.91B

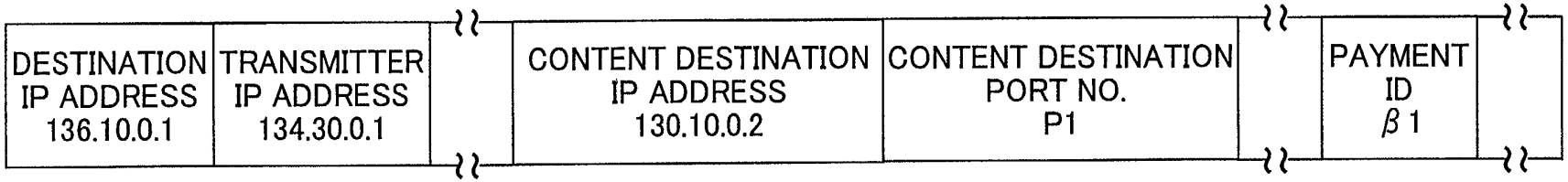


FIG.91C

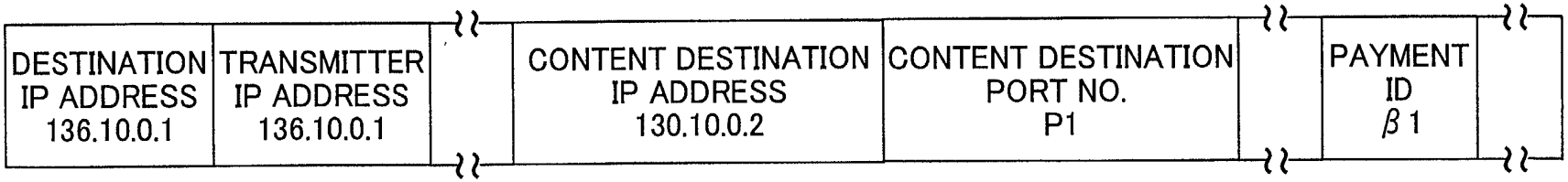


FIG.92A

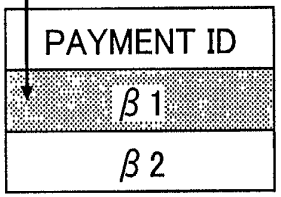


FIG.92B

DESTINATION IP ADDRESS 130.10.0.2	TRANSMITTER IP ADDRESS 134.10.0.1	CONTENT DESTINATION IP ADDRESS 130.10.0.2	CONTENT DESTINATION PORT NO. P1	PAYMENT ID β1

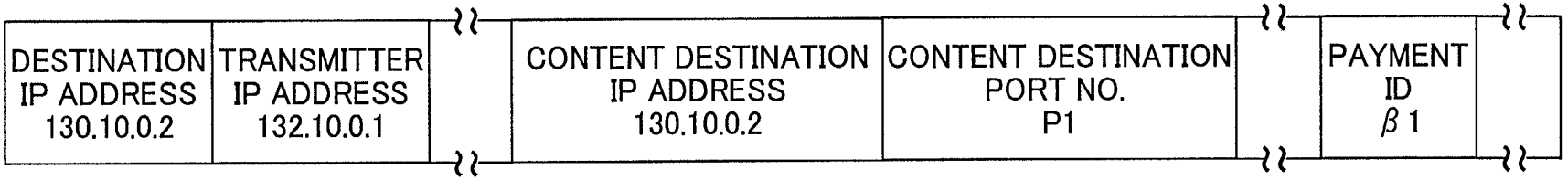

DESTINATION IP ADDRESS 130.10.0.2
TRANSMITTER IP ADDRESS 132.10.0.1
CONTENT DESTINATION IP ADDRESS 130.10.0.2
CONTENT DESTINATION PORT NO. P1
PAYMENT ID β1

FIG.92D

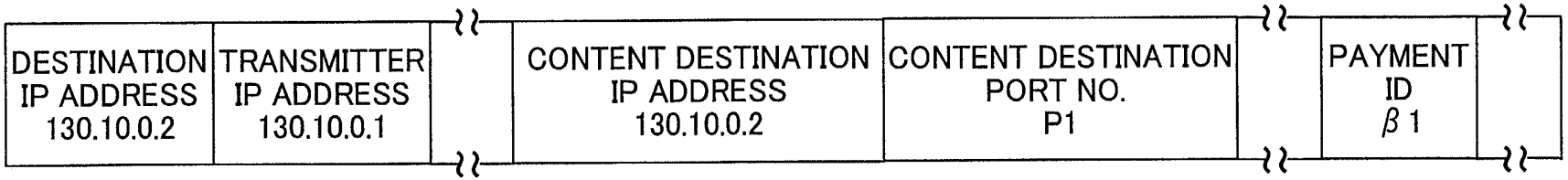

DESTINATION IP ADDRESS 130.10.0.2
TRANSMITTER IP ADDRESS 130.10.0.1
CONTENT DESTINATION IP ADDRESS 130.10.0.2
CONTENT DESTINATION PORT NO. P1
PAYMENT ID β1

FIG.93A

DESTINATION IP ADDRESS 134.40.0.1	TRANSMITTER IP ADDRESS 134.40.0.2	DATA (REQUEST FOR LOG OF BAND USAGE PARTICULARS TABLE)

FIG.93B

DESTINATION IP ADDRESS 134.20.0.2	TRANSMITTER IP ADDRESS 134.40.0.2	DATA (REQUEST FOR LOG OF BAND USAGE PARTICULARS TABLE)

FIG.93C

DESTINATION IP ADDRESS 134.40.0.2	TRANSMITTER IP ADDRESS 134.40.0.1	DATA (LOG OF BAND USAGE PARTICULARS TABLE)

FIG.93D

DESTINATION IP ADDRESS 134.40.0.2	TRANSMITTER IP ADDRESS 134.20.0.2	DATA (LOG OF BAND USAGE PARTICULARS TABLE)

FIG.94A

AMOUNT BILLED (YEN)	PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME
aaa	β1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00
bbb	β1	130.10.0.2	P1	64K	2001/9/1 10:00	2001/9/1 12:00
ccc	β2	132.20.0.2	P6	64K	2001/9/1 9:00	2001/9/1 12:00

FIG.94B

PAYMENT ID	MIDDLEMEN SERVER IP ADDRESS
β1	138.10.0.1
β2	138.10.0.1

FIG.94C

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 134.40.0.2	DATA (BILLING PARTICULARS)

FIG.94D

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 132.50.0.2	DATA (BILLING PARTICULARS)

FIG.94E

DESTINATION IP ADDRESS 138.10.0.1	TRANSMITTER IP ADDRESS 130.40.0.2	DATA (BILLING PARTICULARS)

FIG.95A

AMOUNT BILLED (YEN)	PAYMENT ID	DESTINATION IP ADDRESS	DESTINATION PORT NO.	RESERVED BAND (bps)	USAGE START DATE AND TIME	USAGE END DATE AND TIME	ISP SERVER IP ADDRESS
aaa	β1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00	134.40.0.2
bbb	β1	130.10.0.2	P1	64K	2001/9/1 10:00	2001/9/1 12:00	134.40.0.2
ccc	β2	132.20.0.2	P6	64K	2001/9/1 9:00	2001/9/1 12:00	134.40.0.2
ddd	β1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00	132.50.0.2
eee	β2	132.20.0.2	P6	64K	2001/9/1 9:00	2001/9/1 12:00	132.50.0.2
fff	β1	130.10.0.2	P1	64K	2001/9/1 10:00	2001/9/1 12:00	132.50.0.2
ggg	β1	130.20.0.2	P2	64K	2001/9/1 9:00	2001/9/1 11:00	130.40.0.2
hhh	β1	130.10.0.2	P1	64K	2001/9/1 10:00	2001/9/1 12:00	130.40.0.2

FIG.95B

PAYMENT ID	CONTENT SERVER IP ADDRESS
β1	136.10.0.1
β2	140.10.0.1

FIG.95C

DESTINATION IP ADDRESS 136.10.0.1	TRANSMITTER IP ADDRESS 138.10.0.1	DATA (BILLING PARTICULARS)

FIG.95D

DESTINATION IP ADDRESS 140.10.0.1	TRANSMITTER IP ADDRESS 138.10.0.1	DATA (BILLING PARTICULARS)

FIG.96A

DESTINATION IP ADDRESS 130.10.0.2	TRANSMITTER IP ADDRESS 136.10.0.1	DATA (BILLING PARTICULARS)

FIG.96B

DESTINATION IP ADDRESS 130.20.0.2	TRANSMITTER IP ADDRESS 136.10.0.1	DATA (BILLING PARTICULARS)

FIG.96C

DESTINATION IP ADDRESS 132.20.0.2	TRANSMITTER IP ADDRESS 140.10.0.1	DATA (BILLING PARTICULARS)